Engineering Tool for MP2000 Series Machine Controller

MPE720 Version 6

USER'S MANUAL

TYPE: CPMC-MPE770



YASKAWA

MANUAL NO. SIEP C880700 30B

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Graphic Symbols Used in this Manual

The graphic symbols used in this manual indicate the following type of information.

- This symbol is used to indicate important information that should be memorized or minor precautions, such as precautions that will result in alarms if not heeded.

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Caution on Managing Passwords

The following passwords can be set for this software.

- User passwords (Refer to *1.8.4 (1) Registering New Users*.)
- Project passwords (Refer to *1.8.5 Security: Project Password*.)
- Program passwords (Refer to *1.12.3 Setting Passwords for Ladder Programs*.)
- Online passwords (Refer to *1.12.4 Online Security*.)

If a password is set and then forgotten or lost, a project file can be opened and there is no way, however, to recover a project file or program.
Set passwords carefully and then take full responsibility for managing the passwords.

Caution on Managing Project Files

Project files are always overwritten when closed. A project file cannot be saved under a new name. Whenever a backup file is required, be sure to make a copy of the project file before opening it or before overwriting changes while editing the project.

Table Programming Functions Not Supported by MPE720 Version 6

MPE720 version 6 does not support these three table programming functions: Interlock Tables, Part Composition Tables, and I/O Conversion Tables.

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Chapter 1

Overview and Basic Operations of MPE720 Version 6

This chapter provides an overview of MPE720 version 6 and describes basic MPE720 operations.

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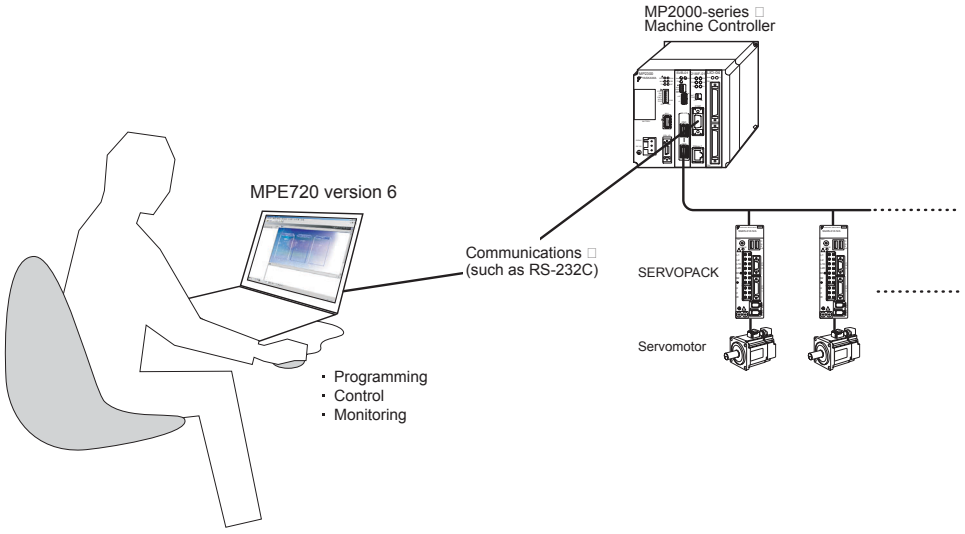
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1.1 What Is MPE720 Version 6?

MPE720 version 6 (CPMC-MPE770) is an engineering tool for MP2000-series Machine Controllers. Installing MPE720 version 6 on a computer and connecting to a Machine Controller via a Communications Module enables programming, control, and monitoring operations from the computer.

* Note: A Communications Module is not required for the MP2100 or the MP2100M.



1.2 Basic Engineering Procedure Using MPE720 Version 6

Use the following procedure to operate a Machine Controller and motion system using MPE720 version 6.

1. Connect the computer to the MP2000-series Machine Controller.

⇩

2. Install MPE720 version 6 on the computer. (Refer to *1.3.3 Installing MPE720 Version 6*.)

⇩

3. Set the Communication Process. (Refer to *1.3.5 Communication Process Settings*.)

⇩

4. Start MPE720 version 6. (Refer to *1.4.1 Starting MPE720 Version 6*.)

⇩

5. Create a project file. (Refer to *1.7.2 Creating New Project Files*.)

⇩

6. Make the required settings. (Refer to *1.9.1 Connecting to Machine Controllers* and *2.1 Module Configuration*.)

⇩

7. Create the programs. (Refer to *Chapter 3 Ladder Programming* and *Chapter 4 Motion Programming*.)

⇩

8. Transfer the programs to the Machine Controller. (Refer to *1.11 Transferring Data*.)

⇩

9. Perform a test run.

1.3 Installing and Uninstalling MPE720 Version 6

1.3.1 MPE720 Version 6 System Requirements

The following table shows the computer system requirements for the computer in which MPE720 version 6 is to be installed and used.

Item	Specifications
CPU	Pentium 800 MHz min. or equivalent. (1 GHz min. is recommended.)
Memory Capacity	128 MB min. (256 MB min. is recommended.)
Display	Resolution: 1,024 x 768 min., 16-bit High Color
Available HDD Space	200 MB min.
CD Drive	One CD drive (Required only for installation.)
Communications Ports	Serial, Ethernet, MP2100 bus, or USB
Operating System	Windows 2000 (service pack 1 or later) Windows XP
Other	Adobe Reader version 6.00 or later (Required for help displays.) Internet Explorer version 5.5 or later (Required for displaying online help for ladder instructions.)

1.3.2 Compatibility with MPE720 Version 5

If MPE720 version 5 is already installed, removal is not required before installing MPE720 version 6. Moreover, MPE720 version 5 will not be overwritten when MPE720 version 6 is installed.
After MPE720 version 6 has been installed, version 5 and version 6 can both be used.

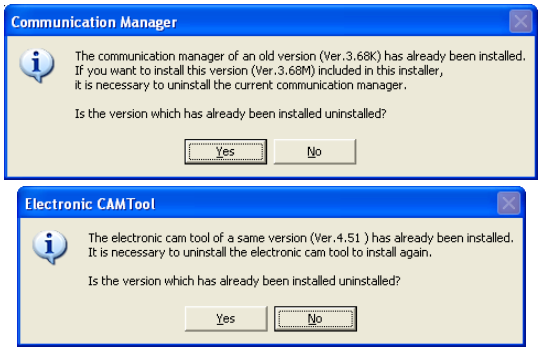
1.3.3 Installing MPE720 Version 6

- If MPE720 version 5 is already installed, uninstall it before installing MPE720 version 6 is not required. Moreover, MPE720 version 5 will not be overwritten when MPE720 version 6 is installed.
- After MPE720 version 6 has been installed, version 5 and version 6 can both be used.
- If MPE720 version 6 has been previously installed, the new installation of MPE720 version 6 will overwrite it.

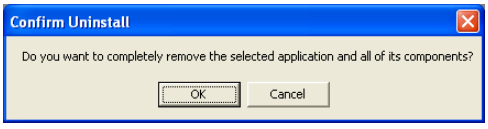
Prepare the MPE720 version 6 installation CD-ROM and use the following procedure to install the software.

1. Start the computer, and insert the installation CD-ROM in the CD-ROM drive.

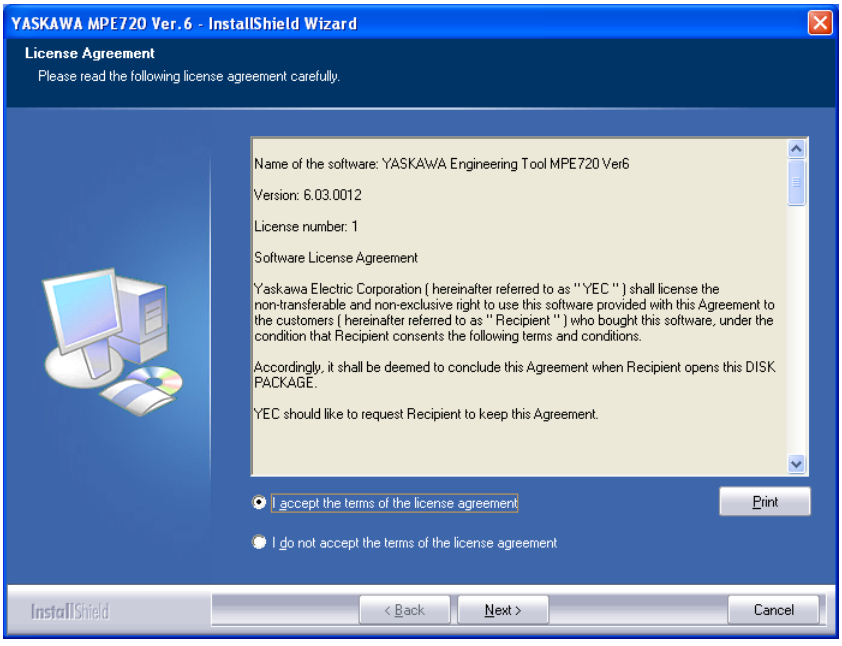
- If any other software applications are running, close them before proceeding.
- If either MPE720 version 5 or MPE720 version 6 is already installed, the following dialog boxes may be displayed for confirmation when the InstallShield Wizard is started. In either case, click the **Yes** Button.


Communication Manager
The communication manager of an old version (Ver.3.68K) has already been installed.
If you want to install this version (Ver.3.68M) included in this installer,
it is necessary to uninstall the current communication manager.
Is the version which has already been installed uninstalled?
Yes
No
Electronic CAMTool
The electronic cam tool of a same version (Ver.4.51) has already been installed.
It is necessary to uninstall the electronic cam tool to install again.
Is the version which has already been installed uninstalled?
Yes
No

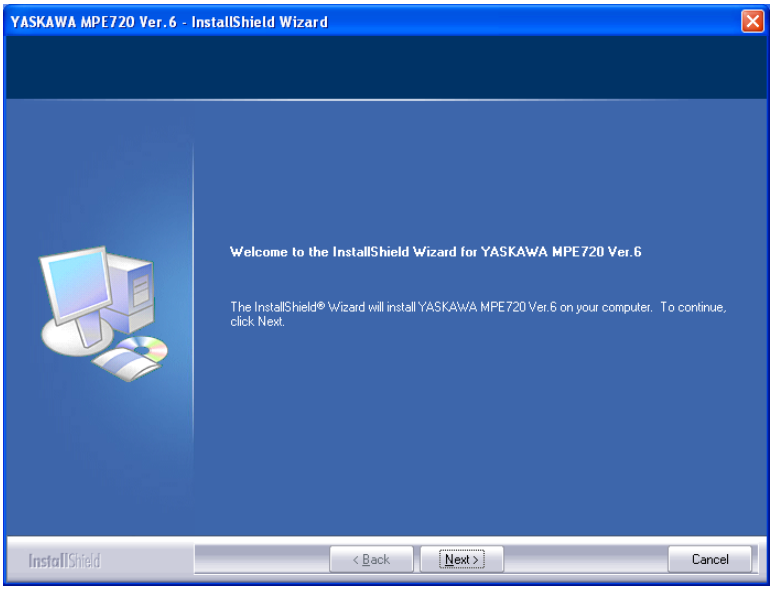
The following dialog box will then be displayed for confirmation. Click the **OK** Button. The earlier version or the same version of the Communications Process or the Electronic CAM Tool will be overwritten.



The MPE720 version 6 Installer will automatically start, the Title Window will be displayed, and then the InstallShield Wizard will be displayed.

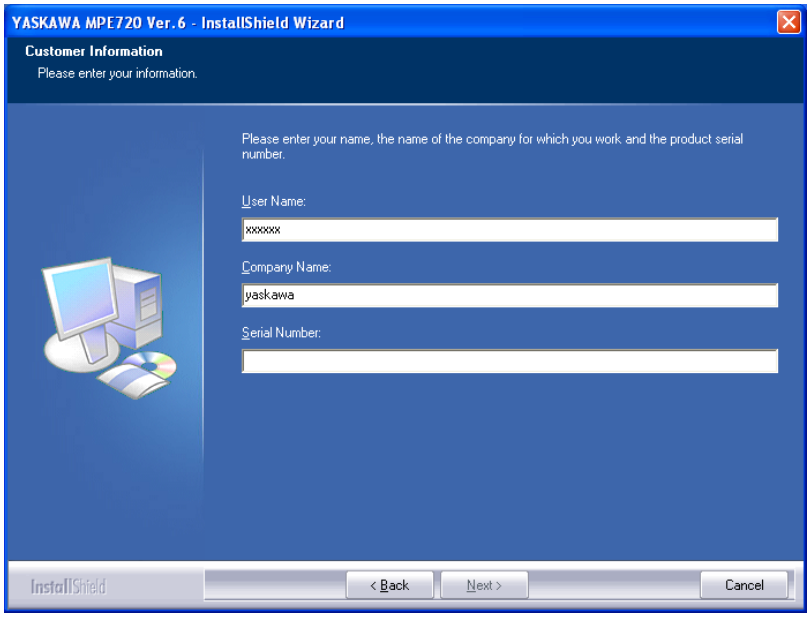

YASKAWA MPE720 Ver.6 - InstallShield Wizard
License Agreement
Please read the following license agreement carefully.
Name of the software: YASKAWA Engineering Tool MPE720 Ver6
Version: 6.03.0012
License number: 1
Software License Agreement
Yaskawa Electric Corporation (hereinafter referred to as " YEC ") shall license the non-transferable and non-exclusive right to use this software provided with this Agreement to the customers (hereinafter referred to as " Recipient ") who bought this software, under the condition that Recipient consents the following terms and conditions.
Accordingly, it shall be deemed to conclude this Agreement when Recipient opens this DISK PACKAGE.
YEC should like to request Recipient to keep this Agreement.
I accept the terms of the license agreement
I do not accept the terms of the license agreement
Print
InstallShield
< Back
Next >
Cancel

2. Click the **Next** Button to continue.


YASKAWA MPE720 Ver.6 - InstallShield Wizard
Welcome to the InstallShield Wizard for YASKAWA MPE720 Ver.6
The InstallShield® Wizard will install YASKAWA MPE720 Ver.6 on your computer. To continue, click Next.
InstallShield
< Back
Next >
Cancel

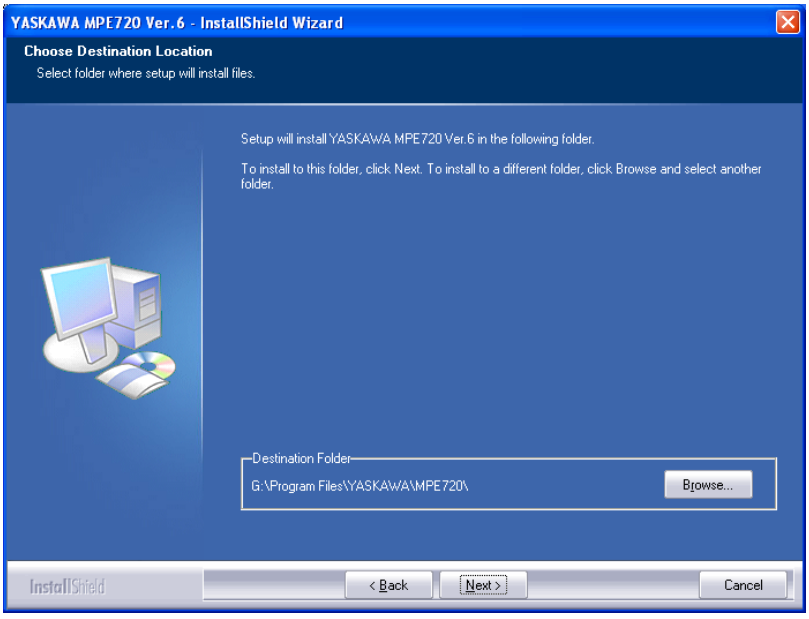
The Customer Information Window will be displayed for registration.

3. Enter the user name, company name, and product serial number, and then click the **Next** Button to continue.



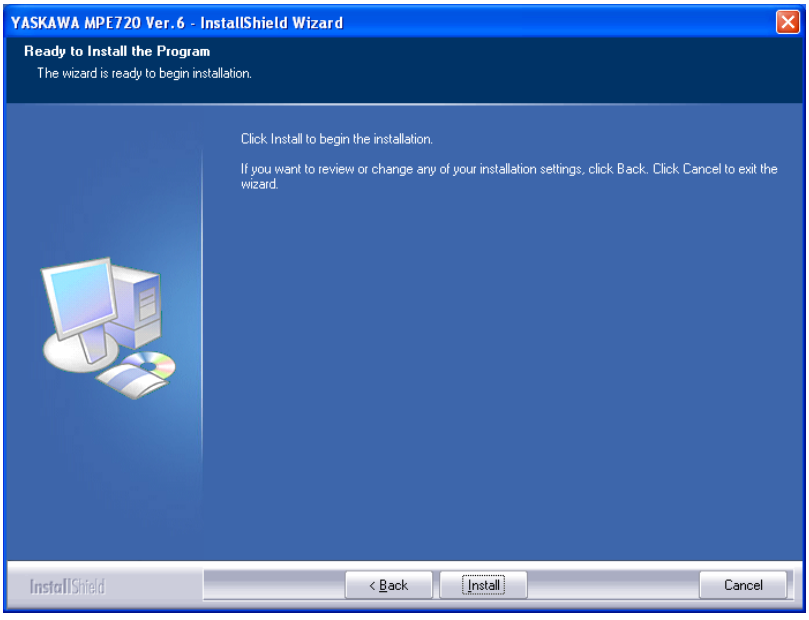
A window to set the destination folder for the installation will be displayed.

4. To install the program in the destination folder that is displayed, click the **Next** Button. To install it in a different folder, click the **Browse** Button, specify the destination folder, and then click the **Next** Button.


YASKAWA MPE720 Ver.6 - InstallShield Wizard
Choose Destination Location
Select folder where setup will install files.
Setup will install YASKAWA MPE720 Ver.6 in the following folder.
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.
Destination Folder
G:\Program Files\YASKAWA\MPE720\
Browse...
InstallShield
< Back
Next >
Cancel

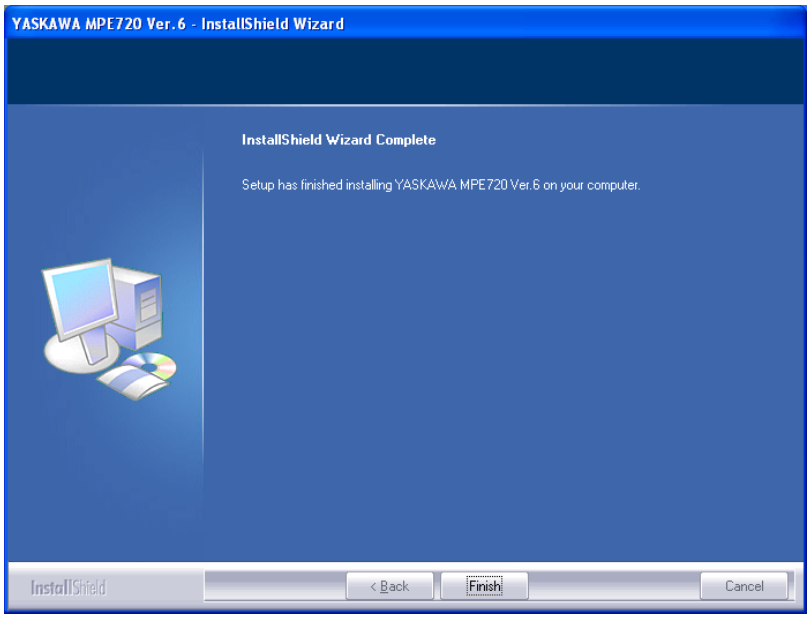
A window to begin the installation will be displayed.

5. Click the **Install** Button.


YASKAWA MPE720 Ver.6 - InstallShield Wizard
Ready to Install the Program
The wizard is ready to begin installation.
Click Install to begin the installation.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
InstallShield
< Back
Install
Cancel

The installation will begin, and messages to indicate the progress will be displayed. When the installation has been completed, a window to complete the installation will be displayed.

6. Click the **Finish** Button.



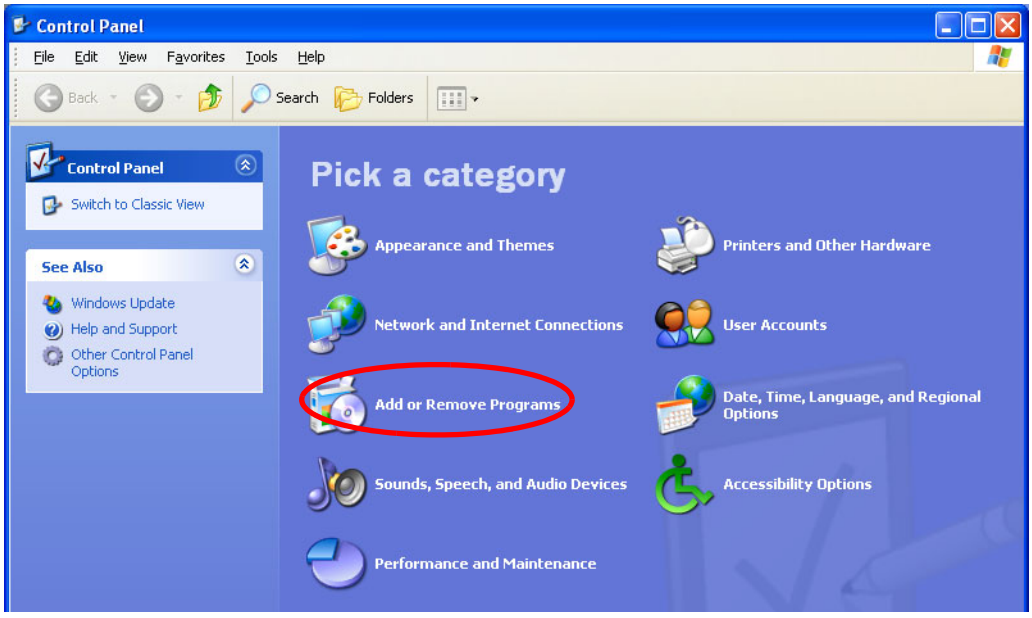
The InstallShield Wizard will close and the installation of MPE720 version 6 will be completed.

1.3.4 Uninstalling MPE720 Version 6

Use the following procedure to uninstall MPE720 version 6.

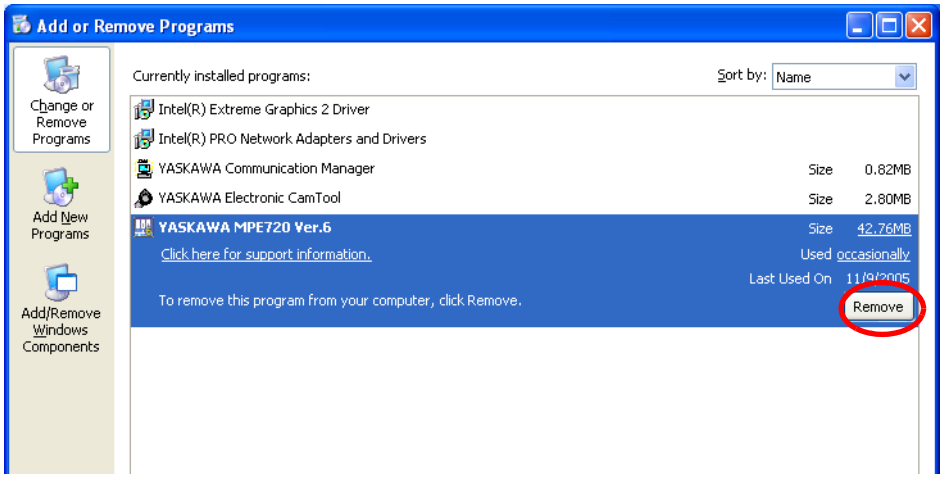
1. Exit MPE720 version 6 and open the Windows Control Panel.

2. Double-click ***Add or Remove Programs*** *(or Add or Remove Applications* in Windows 2000).



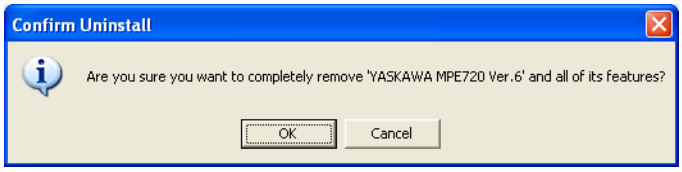
The **Add or Remove Programs** Window will be displayed.

3. Select *YASKAWA MPE720 Ver.6* from the list of programs, and click the **Remove** Button.



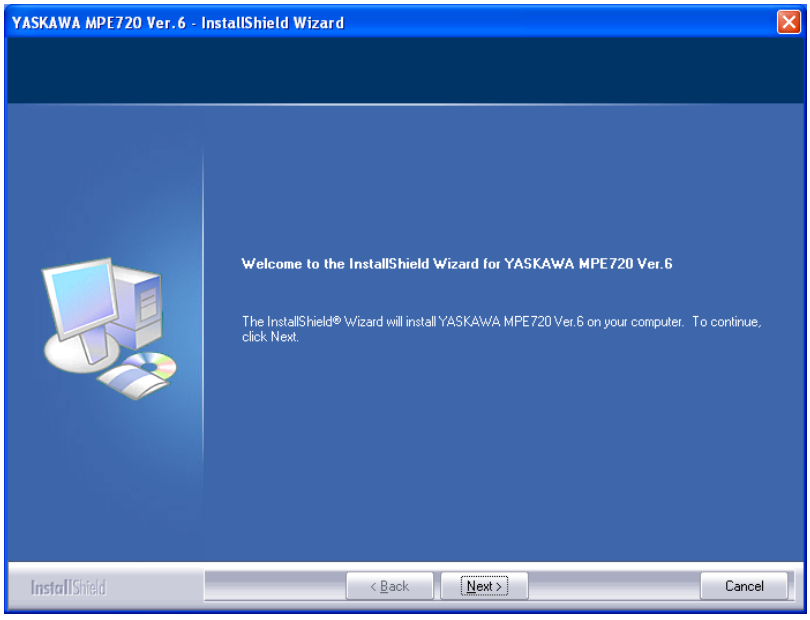
A dialog box will be displayed for confirmation that the program is to be removed.

4. Click the **OK** Button.



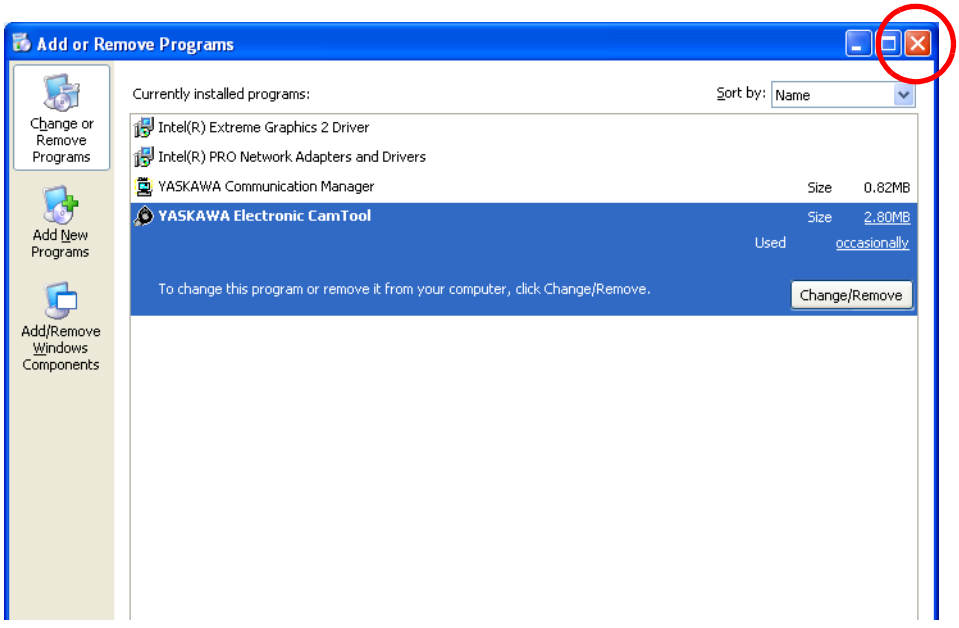
The operation to uninstall MPE720 version 6 will begin. When uninstall is finished, the **Maintenance Complete** Window will be displayed.

5. Click the **Finish** Button.


YASKAWA MPE720 Ver.6 - InstallShield Wizard
Welcome to the InstallShield Wizard for YASKAWA MPE720 Ver.6
The InstallShield® Wizard will install YASKAWA MPE720 Ver.6 on your computer. To continue, click Next.
InstallShield
< Back
Next >
Cancel

The **Add or Remove Programs** Window will again be displayed.

6. Click the **Close** Button (X) to close the Control Panel.



1.3.5 Communication Process Settings

The Communication Manager (Communication Process), which is installed along with MPE720 version 6, is used to set the communication port at the computer that is used to connect to the Machine Controller.

(1) Serial Port Settings

[a] How to Set a Serial Port

- If the Communication Process settings have already been made for MPE720 version 5, settings will not have to be reconfigured after installing version 6.

1. Start the Communication Manager (Communication Process) either by double-clicking the **Communication Manager** Icon in the **YE_Applications** Folder on the desktop or by clicking the **Start** Button and selecting ***Programs - YE_Applications - Communication Manager***.

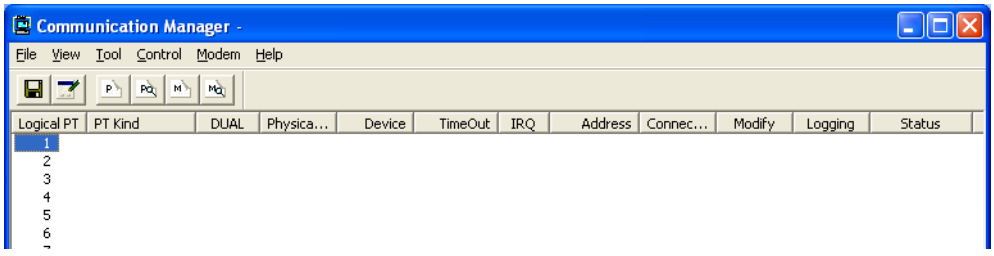
The **Communication Process** Icon will be displayed in the task bar at the bottom right of the screen.

2. Double-click the **Communication Process** Icon in the task bar to display the Communication Manager Window.



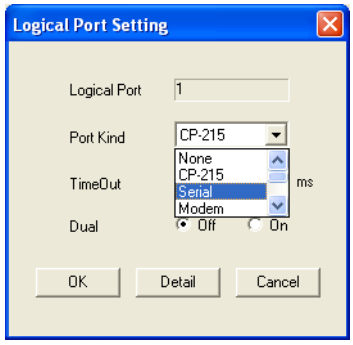
- If the window is not displayed when the **Communication Process** Icon is double-clicked, then right-click the icon and select ***Application Display*** from the pop-up menu.

3. Double-click the logical port number (*logical PT*) for which the settings are to be made.



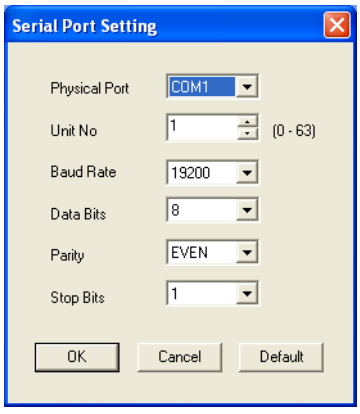
The **Logical Port Setting** Dialog Box will be displayed.

4. Select *Serial* from the *Port Kind* list, and then click the **Detail** Button.



The **Serial Port Setting** Dialog Box will be displayed.

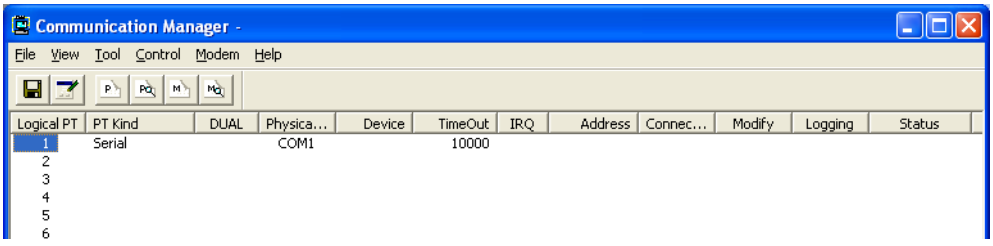
5. Set each item, and then click the **OK** Button.



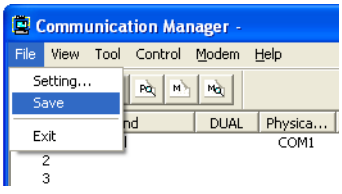
The **Logical Port Setting** Dialog Box will again be displayed.

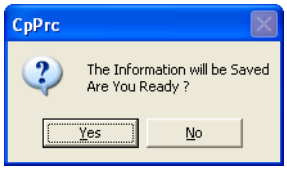
6. Click the **OK** Button in the **Logical Port Setting** Dialog Box. The **Communication Manager** Window will again be displayed.

Serial will be displayed for the logical port selected in step 3.

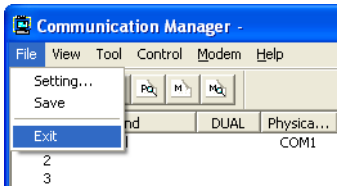


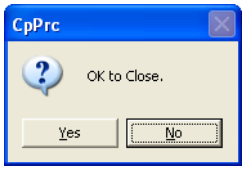
7. Select ***File - Save*** and then click the **Yes** Button in the dialog box displayed for confirmation. The settings will be saved.





8. Select ***File - Exit*** and then click the **Yes** Button in the dialog box displayed for confirmation. The Communication Manager (Communication Process) will be closed.

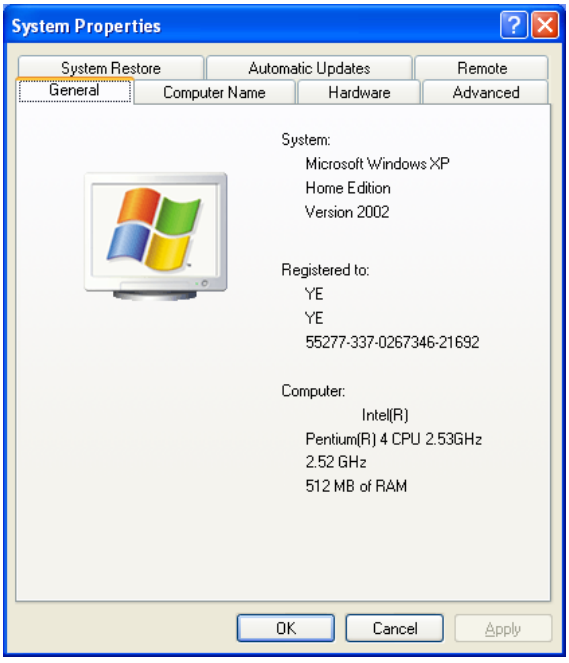




[b] How to Set a Serial Port with a USB Serial Conversion Adapter

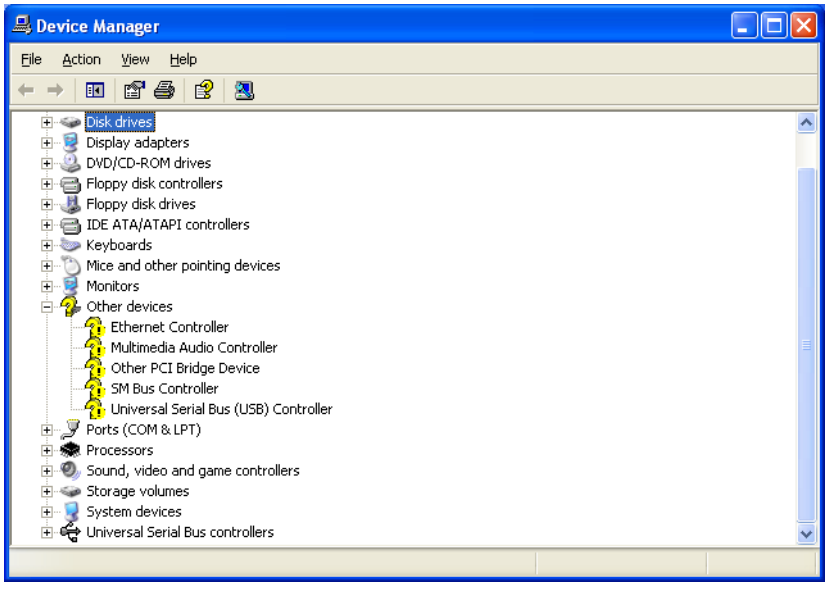
If the personal computer is connected to the Machine Controller using a USB serial port conversion adapter, confirm the logical port in the following manner.

1. Right-click the **My Computer** Icon on the desktop, and then select ***Properties*** from the pop-up menu.



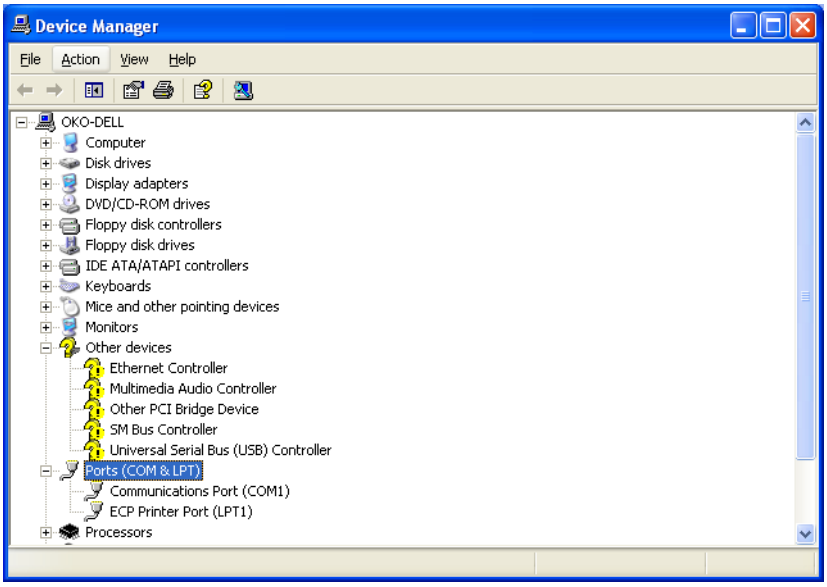
The **System Properties** Dialog Box will open.

2. Select the **Hardware** Tab, and then click ***Device Manager***.



The **Device Manager** Window will open.

3. Click [+] on ***Ports (COM & LPT)*** to display the tree.



4. Set the physical port of the newly added port name in the **Serial Port Setting** Dialog Box opened from the **Communication Manager** Window.

(2) Ethernet Connection Settings

This setting is needed for engineering using a 10BASE Ethernet connection via a CP-218 communications port (Ethernet) on the 218IF-01 Module. For an Ethernet connection, a general-purpose Ethernet board or PCMCIA Ethernet card must be installed in the personal computer connected to the Machine Controller. Also, the IP address of the personal computer must be properly set.

[a] Installing an Ethernet Card

Connect a general-purpose Ethernet board or PCMCA Ethernet card to the specified connector on the personal computer. When using a PCMCA Ethernet card, the driver provided with the card must be installed in the personal computer.

[b] Setting the IP Address

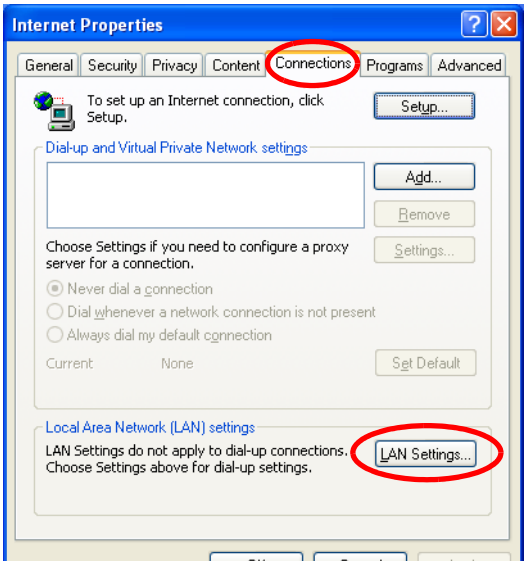
The IP address of the personal computer must be set before setting the Ethernet connection. Set the IP address in the following manner.

- Set the IP address with a LAN cable connected to the personal computer.

1. Click the **Start** Button and then select ***Settings*** - ***Control Panel*** from the start menu. Click the **Internet Options** Icon in Control Panel.

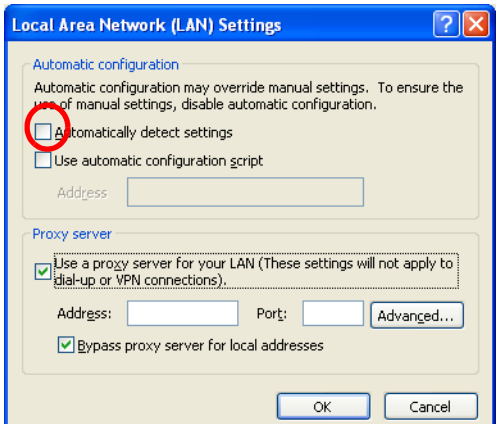
The **Internet Properties** Dialog Box will open.

2. Select the **Connections** Tab, and then click the **LAN Settings** Button.



The **Local Area Network (LAN) Settings** Dialog Box will open.

3. Confirm that the ***Automatically detect settings*** check box is not selected, and then click **OK** to close the dialog box.

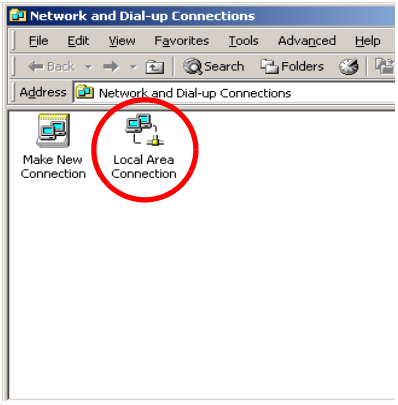

Local Area Network (LAN) Settings
Automatic configuration
Automatic configuration may override manual settings. To ensure the use of manual settings, disable automatic configuration.
Automatically detect settings
Use automatic configuration script
Address
Proxy server
Use a proxy server for your LAN (These settings will not apply to dial-up or VPN connections).
Address:
Port:
Advanced...
Bypass proxy server for local addresses
OK
Cancel

4. For Windows 2000, click the **Start** Button, and then select ***Settings*** - ***Control Panel***. Click the Network and Dial-up Connections Icon in the Control Panel.
For Windows XP, click the **Start** Button, and then select ***Settings*** - ***Control Panel***. Click the **Network Connections** Icon in the Control Panel.

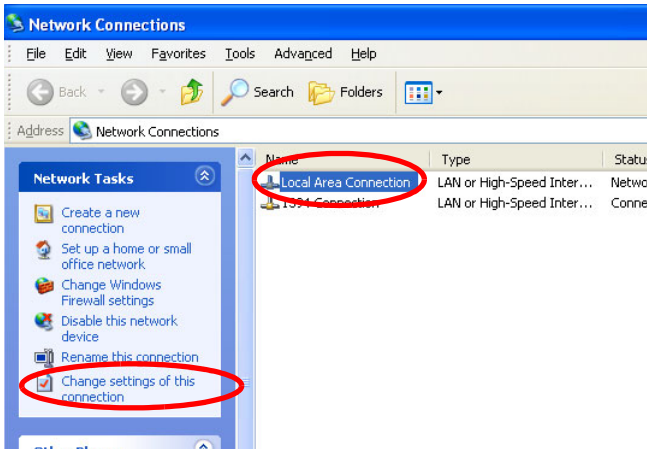
The **Network and Dial-up Connections** Window on Windows 2000, or the **Network Connections** Window on Windows XP, will be displayed.

5. For Windows 2000, double-click the **Local Area Connection** Icon.
For Windows XP, select ***Local Area Connection***, and then click ***Change settings of this connection*** in the Network Tasks field.

< Windows 2000 >

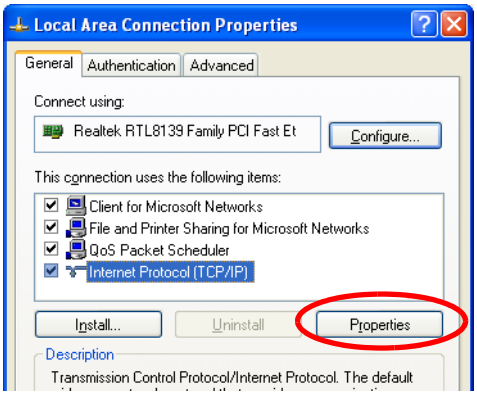

Network and Dial-up Connections
File Edit View Favorites Tools Advanced Help
Search Folders
Address Network and Dial-up Connections
Make New Connection
Local Area Connection

< Windows XP >


Network Connections
File Edit View Favorites Tools Advanced Help
Back Search Folders
Address Network Connections
Network Tasks
Create a new connection
Set up a home or small office network
Change Windows Firewall settings
Disable this network device
Rename this connection
Change settings of this connection
Name Type
Local Area Connection LAN or High-Speed Inter...

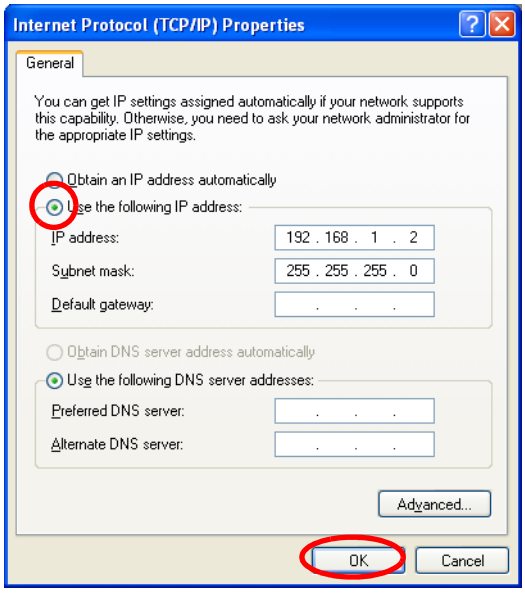
The **Local Area Connection Properties** Dialog Box will be displayed.

6. Select the ***Internet Protocol (TCP/IP)*** check box in the General Tab Page, and then click the **Properties** Button.



The **Internet Properties (TCP/IP)** Dialog Box will open.

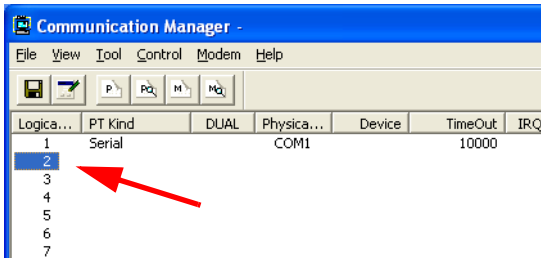
7. Select **Use the following IP address**, and then enter “192 169 1 2” for the ***IP address*** and “255 255 255 0” for the ***Subnet mask***.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

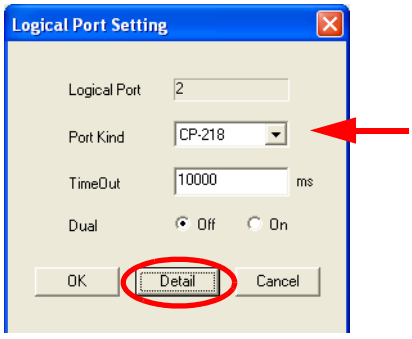
8. Click **OK** to close the dialog box.

[c] CP-218 Communications Port Settings

1. Double-click No. ***2*** under ***Logical PT*** in the **Communication Manager** Window to open the **Logical Port Setting** Dialog Box.

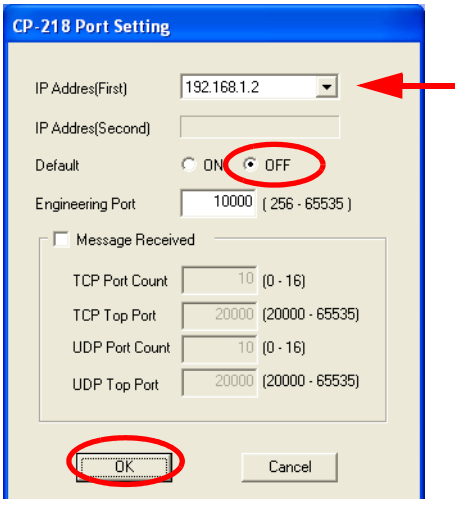


2. In the **Logical Port Setting** Dialog Box, select ***CP-218*** for ***Port Kind***, and then click **Detail**.

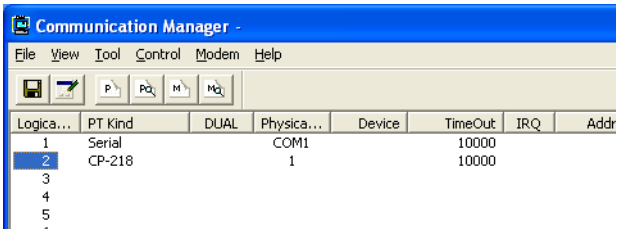


The **CP-218 Port Setting** Dialog Box will open.

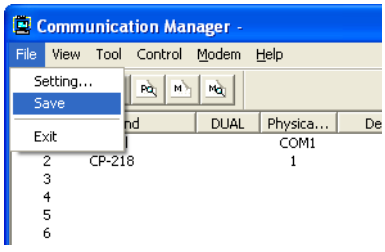
3. Enter the IP address of the personal computer for ***IP Address (First)*** and select the ***OFF*** option for ***Default***. Leave the other items at their default settings, and then click **OK** to close the dialog box.

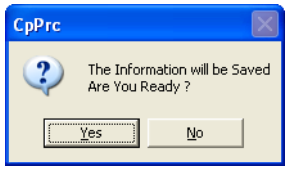

CP-218 Port Setting
IP Addres(First) 192.168.1.2
IP Addres(Second)
Default ON OFF
Engineering Port 10000 (256 - 65535)
Message Received
TCP Port Count 10 (0 - 16)
TCP Top Port 20000 (20000 - 65535)
UDP Port Count 10 (0 - 16)
UDP Top Port 20000 (20000 - 65535)
OK Cancel

4. When **OK** is clicked in the **Logical Port Setting** Dialog Box, you will be returned to the **Communication Manager** Window.
CP-218 will be displayed for the logical port selected in step 1.

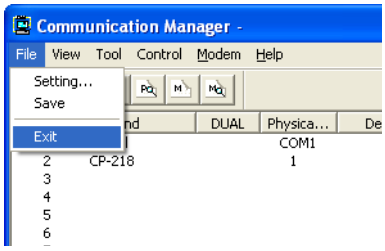


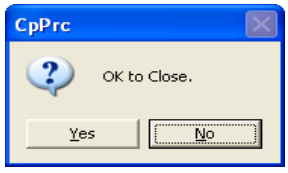
5. Select ***File-Save***, and then click **Yes** in the dialog box displayed for confirmation.
The setting will be saved.





6. Select ***File-Exit***, and then click **Yes** in the dialog box displayed for confirmation.
The setting will be saved.



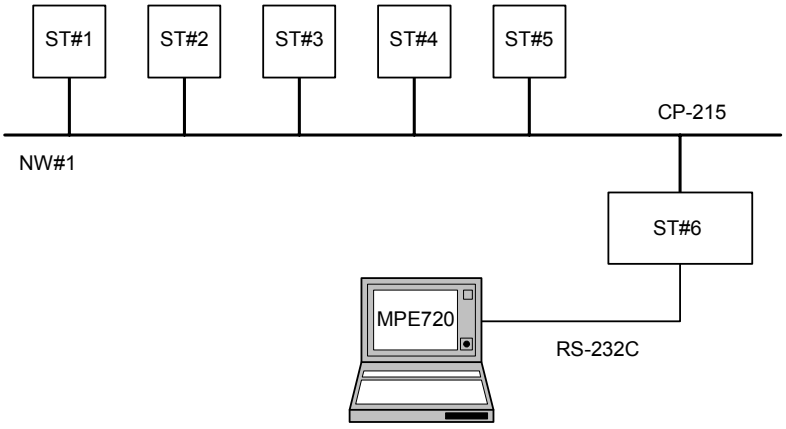


(3) 215AIF-01 Module Network Relay Function

An entire system can be managed and controlled from the MPE720 version 6 by using more than one 215AIF-01 Module mounted relay station[*1] (Machine Controller). By allocating an unique network number (NW#nn) to each network segment and a unique station number (ST#nn) to the 215AIF-01 Module in each network segment, all devices connected to all networks can be identified by their network addresses, specified with the combination of these two numbers.

In this way, the relay function enables message communications[*2] among networks.

The following diagram illustrates an example of a network configuration that uses the relay function.



* 1. “Relay Station” indicates an MP2□00 Machine Controller eqipped with more than one 215AIF-01 Module whose MPLINK or MR connectors are connected with another network’s MPLINK/CP-215 cables to transmit data between networks.
* 2. Only engineering message transmission is possible with the relay function.
  - To use the relay function, “Message relay function” must be enabled, and “Relayed network number” must be specified by setting the 215AIF-01 Module parameters.

1.4 Starting and Exiting MPE720 Version 6

1.4.1 Starting MPE720 Version 6

Use any of the following methods to start MPE720 version 6.

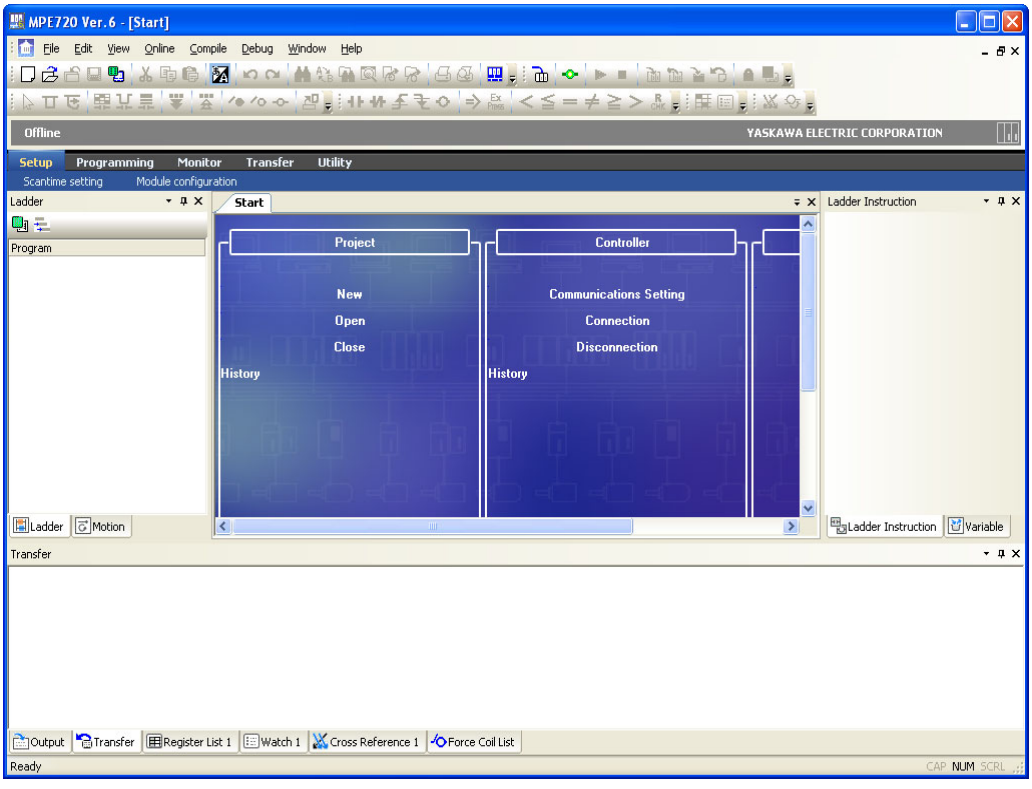
(1) Starting from a Desktop Icon



Double-click the icon (shown in the illustration) that was created on the desktop when MPE720 version 6 was installed. MPE720 version 6 will start and the **MPE720 Ver.6** Window will be displayed as shown below.

(2) Starting from the Windows Start Menu

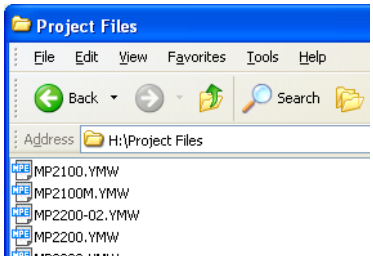
Click the **Start** Button and select ***All Programs - YE_Applications - MPE720 Ver.6***.



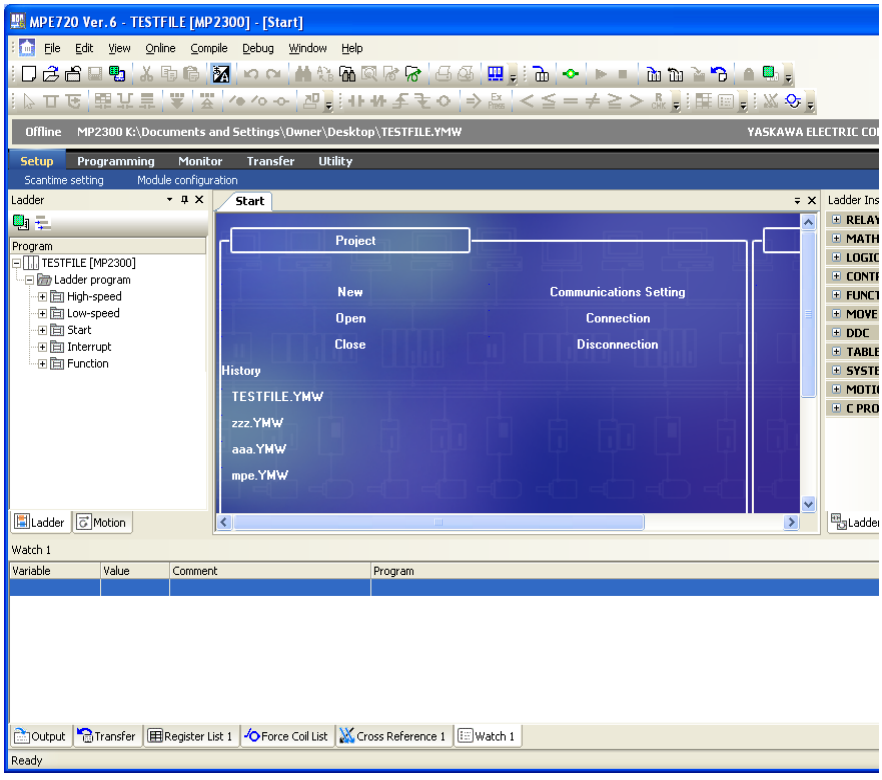
MPE720 version 6 will start and the **MPE720 Ver.6** Window will appear as shown above.

- For details on the **Start** Window, refer to *1.5.2 Start Window.*
- For details on opening project files, refer to *1.7.2 Creating New Project Files* and *1.7.3 Opening Project Files.*

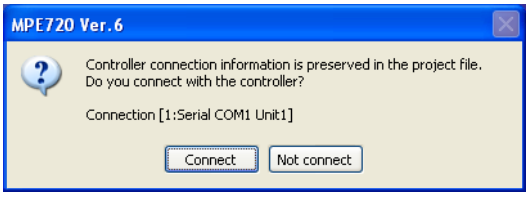
(3) Starting from a Project File



If a project file has already been created, either double-click or right-click the icon and then select ***Open***. (Refer to *1.7 Project Files*.) MPE720 version 6 will start and the **MPE720 Ver.6** Window will appear as shown below.



When MPE720 version 6 is started from a project file, then only *Project* and *Help* will be displayed in the **Start** Window as shown above, and their contents will be displayed in ladder and variable subwindows.
If the contents of communications settings are stored in the selected project file, the following dialog box will open. (Refer to *1.9.1 Connecting to Machine Controllers*.)


MPE720 Ver.6
Controller connection information is preserved in the project file.
Do you connect with the controller?
Connection [1:Serial COM1 Unit1]
Connect
Not connect

When the **Connect** Button Is Clicked

The port set in the communications settings will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

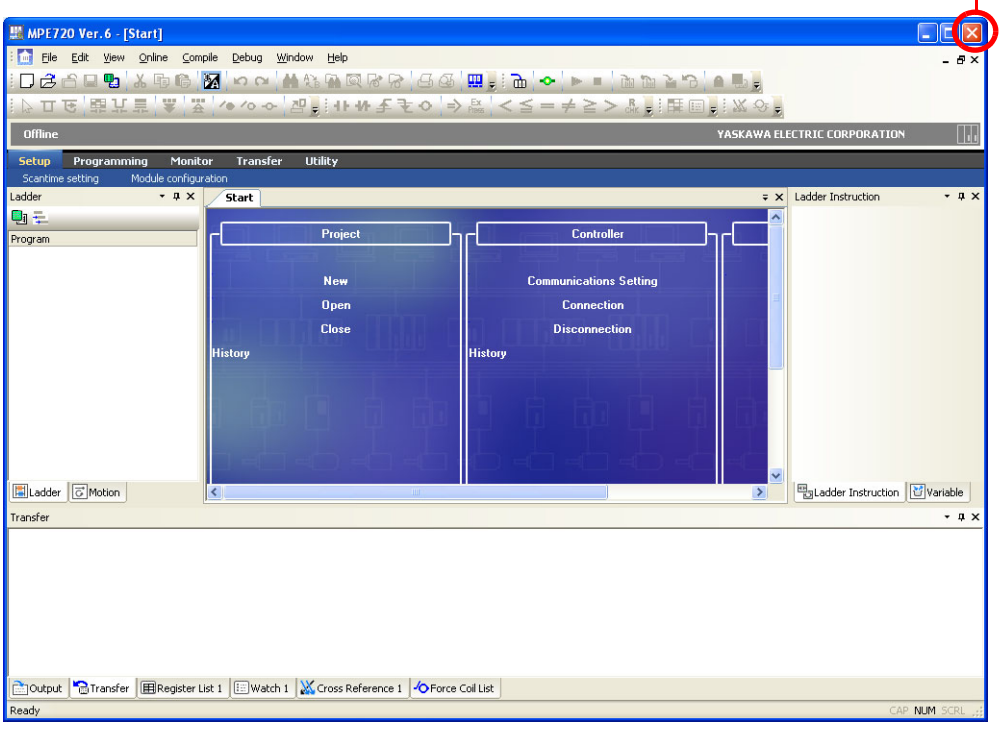
When the **Not Connect** Button Is Clicked

The project file (on the computer) that was first selected will be displayed.

- For details on the Start Window, refer to *1.5.2 Start Window*.
- For details on starting the Ladder Editor Window, refer to *3.2.1 Creating New Ladder Programs* and *3.2.3 Opening Ladder Programs*.

1.4.2 Exiting MPE720 Version 6

Either select ***File - Exit*** from the Main Menu or click the **Close** Button (X) in the **MPE720 Ver.6** Window.

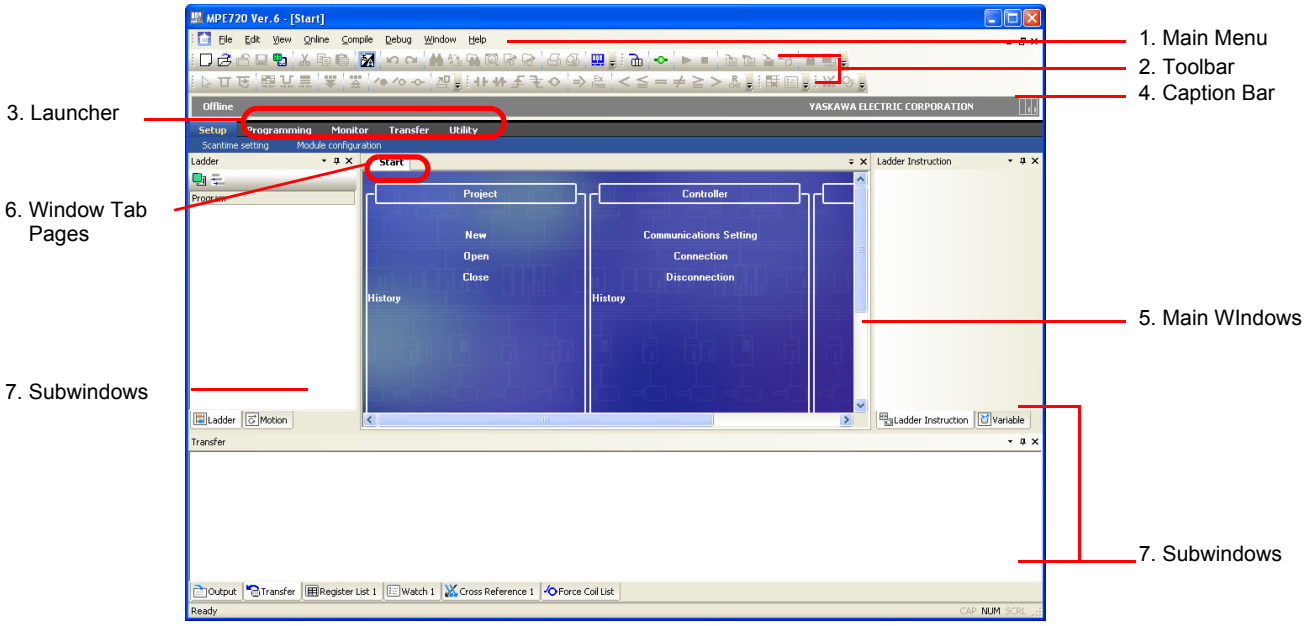


The project file will be automatically compressed and saved, the window will close, and MPE720 version 6 will close.

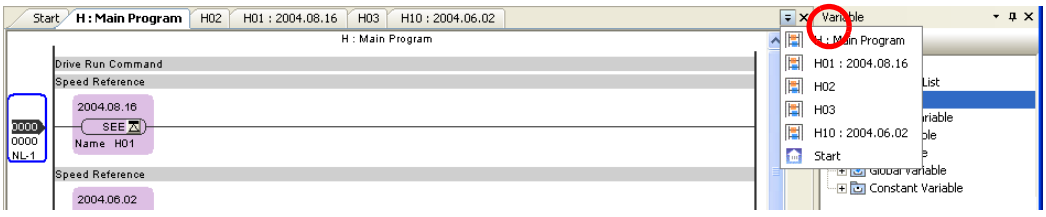
1.5 MPE720 Version 6 Window Operations

1.5.1 Names and Descriptions of Window Components

A description of each of the **MPE720 Ver.6** Window components is provided below.



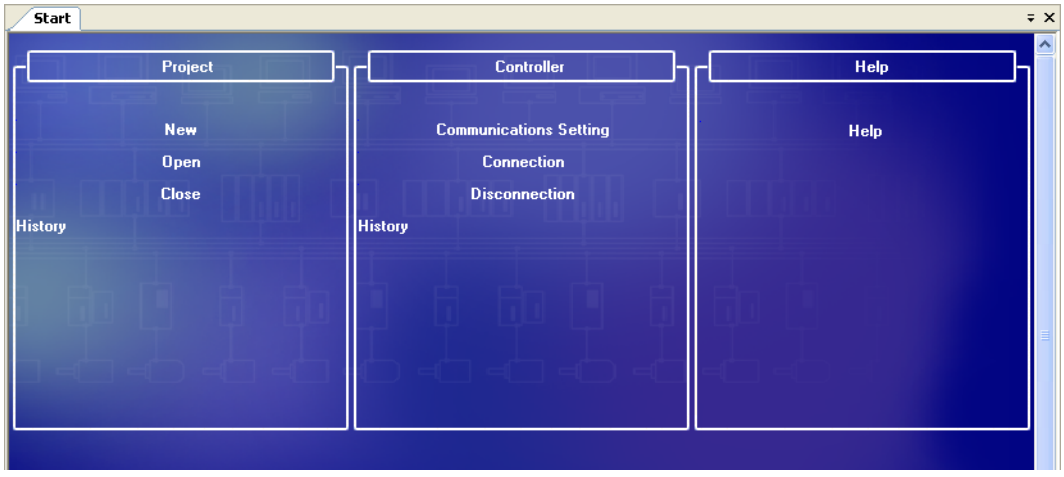
1. Main Menu
   Used to select operations required for using MPE720 version 6.
2. Toolbar
   Used to facilitate using functions related to project file management and programming.
3. Launcher
   A submenu bar for quick and easy access to often-used functions.
   - The launcher can be set to be displayed or hidden in the ***View*** Menu.
4. Caption Bar
   Displays the Machine Controller connection status (online or offline), Machine Controller name, CPU status (when online), and project file name (when offline).
5. Main Windows
   Aside from the **Start** Window, the following windows are displayed depending on the operation selected.
   Ladder Program Edit Window (Refer to *3.3.1 Ladder Program Edit Window*.)
   Motion Program Edit Window (Refer to *Chapter 4 Motion Programming*.)
   Data Trace Edit Window (Refer to *Chapter 7 Data Tracing*.)
   Register Comment Edit Window (Refer to *5.7.1 Referencing Comment Lists*.)
   - For details on the Start Window, refer to *1.5.2 Start Window*.
6. Window Tab Pages
   Used to select the window displayed in the foreground when multiple windows are displayed. If there are many windows and not all of the tabs can be displayed, click the [▼] symbol to display a list of tabs from which to select.



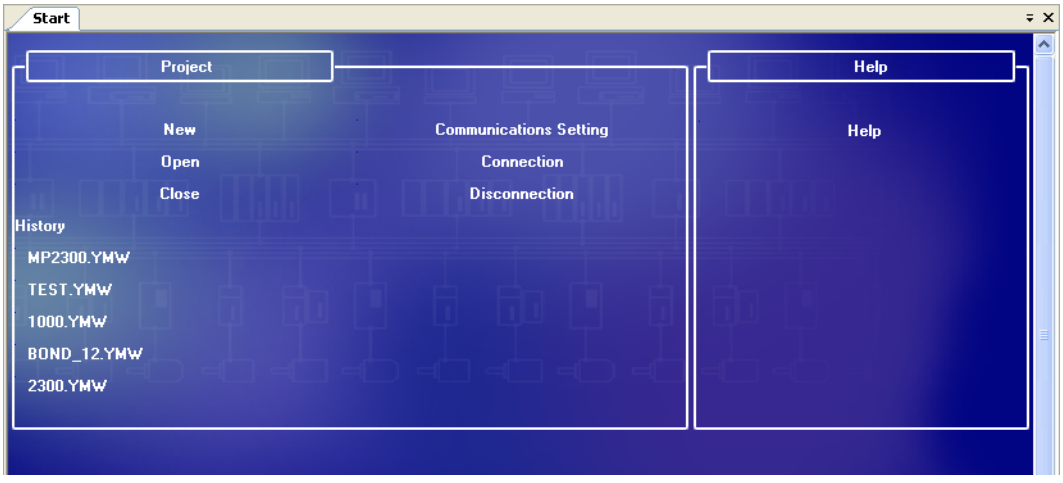
7. Subwindows
   Subwindows are windows for supplementing the operations in the main windows. Multiple subwindows can be displayed by selecting from the ***View*** Menu. (Refer to *1.6 Subwindow Operations*.)

1.5.2 Start Window

The appearance of the **Start** Window depends on whether or not a project file is open.



When a Project File Is Not Opened



When a Project File Is Opened

The following items are displayed in the **Start** Window.

Project

New: Display the **Create New Project** Dialog Box. A new project file can then be created. (Refer to *1.7.2 Creating New Project Files.*)

Open: Display the **Open Project** Dialog Box. A Project File can then be selected and opened. (Refer to *1.7.3 Opening Project Files*.)

Close: Automatically save and close the project file. (Refer to *1.7.6 Closing Project Files.*)

History (File Name): The names of the five project files most recently created or edited using MPE720 version 6 can be displayed in order beginning with the most recent. If a file name is clicked, the project file is opened. By moving the cursor over a file name, a balloon appears. And the location of the file, the date that the file was created, and the date that it was changed can be confirmed. (Refer to *1.7.3 Opening Project Files*.)

- If any of the above operations (i.e., opening a project file from *New*, *Open*, *Close*, or *History*) are executed while connected to the Machine Controller, the connection will be closed.

Controller

Communications Setting: Display the **Communications Setting** Dialog Box. The communications port can then be set, and a connection can be made to the Machine Controller. (Refer to *1.9.1 Connecting to Machine Controllers.*)

Connection: Enable a connection to the Machine Controller using the communications port that is currently set. (Refer to *1.9.1 Connecting to Machine Controllers.*)

Disconnection: Close the connection with the Machine Controller. (Refer to *1.9.2 Disconnecting from Machine Controllers*.)

History (Connection Name): Up to five connection names (logical port number + port type) that have been used for connections can be displayed. When a connection name is clicked, changes the Machine Controller to which the connection is to be made can be selected. (Refer to *1.9.1 Connecting to Machine Controllers.*)

Help

Help: Start Acrobat Reader and displays help for MPE720 version 6.

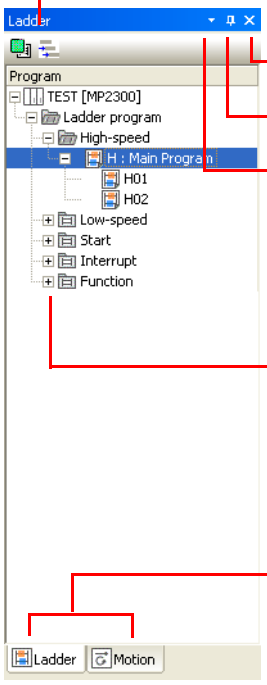
- When the **Close** Button (**X**) in the Start Window is clicked, the start window moves to the last main window without closing. To exit MPE720 version 6, either click the **Close** Button in the **MPE720 Ver.6** Window or select ***File - Exit*** from the main menu.

■ Saving Data when Connected to a Machine Controller after Opening a Project File

When MPE720 version 6 is started from a project file and a connection is made to a Machine Controller from the **Communications Setting** Dialog Box or when a connection is made to a Machine Controller from Connection (Connection Name) in the Start Window, the display will be changed to the contents of the application data stored in the Machine Controller RAM. If the displayed application data is edited and then a save or exit (disconnection) operation is executed, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

1.6 Subwindow Operations

1.6.1 Descriptions of Subwindow Components



Title Bar: The title bar of the currently selected (activated) subwindow is displayed. The title bar can be switched to a floating configuration with multiple subwindows by dragging it.

Close Button: Close the currently selected subwindow. To display the subwindow again, select the subwindow name from the ***View*** Menu.

Automatic Hide Button: Specify automatic hide status. (Refer to *1.6.4 Types of Subwindow Displays*.)

Menu Button: Display the menu for selecting the subwindow display status. (Refer to *1.6.5 Changing the Subwindow Display Type*.)

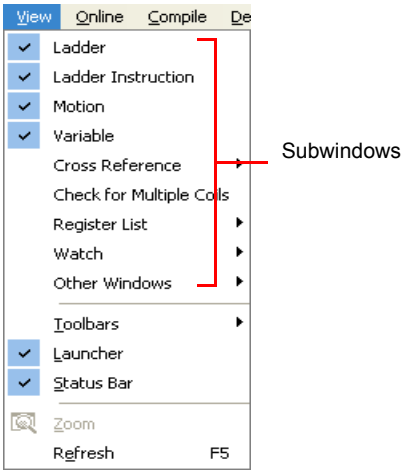
Expand Button: Displayed in a subwindow when a tree hierarchy or category list is displayed. Expand the display to show the lower levels of the hierarchy or a list of items included in the category. When the **Collapse** Button (-) is clicked, the displayed list restores the original display.

Tabs: Change the subwindow to be displayed.

The order of the tabs can be changed by dragging one tab over another tab.

The subwindow display type can be changed from docked to floating by dragging the tab for that subwindow to a position outside of the currently displayed subwindow. (Refer to *1.6.4 Types of Subwindow Displays*.)

1.6.2 Displaying and Hiding Subwindows



Subwindows can be selected for display from the ***View*** Menu. When a subwindow that is currently displayed is clicked, the checkbox is cleared and the subwindow is hidden.

Ladder Subwindow
- Refer to *3.4.3 Managing Ladder Program Files.*

Ladder Instruction Subwindow
- Refer to *3.3.10 Inserting Instruction Objects.*

Motion Subwindow
- Refer to *Chapter 4 Motion Programming.*

Variable Subwindow
- Refer to *5.1 Overview.*

Cross Reference Subwindows (1 to 3)
- Refer to *3.5.4 Cross Reference Searching.*

Check for Multiple Coils Subwindow
- Refer to *3.5.5 Searching for Duplicate Coils.*

Register List Subwindows (1 to 3)
- Refer *6.2.1 Register Lists.*

Watch Subwindows (1 to 3)
- Refer to *6.2.2 Watch Function.*

Other Windows: Output Subwindow
- Refer to *3.3.17 Ladder Program Compiling and Compile Options.*

Other Windows: Find Subwindows (1 and 2)
- Refer to *3.5.2 Searching and Replacing.*

Other Windows: Transfer Subwindow
- Refer to *1.11 Transferring Data.*

Other Windows: Forced Coil List Subwindow
- Refer to *3.5.6 (2) Changing ON/OFF Status of Forced Coil.*

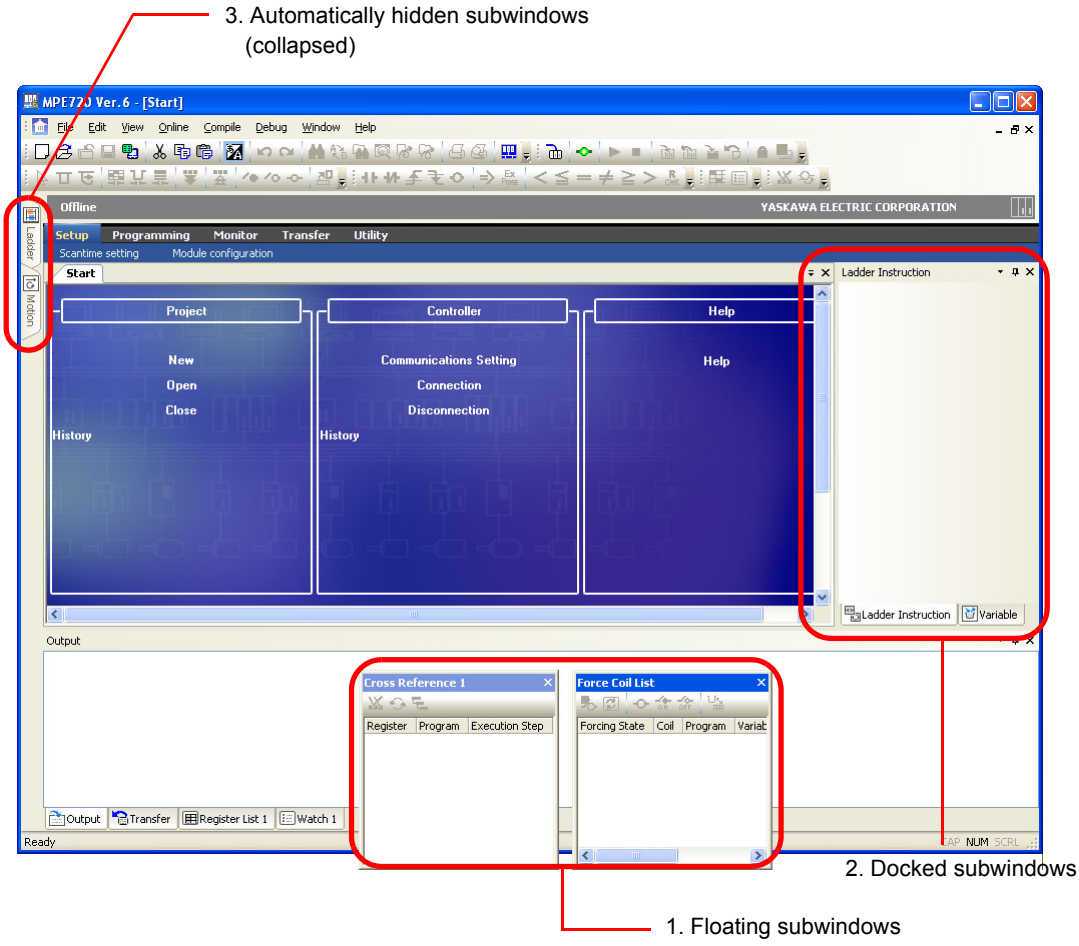
1.6.3 Updating Subwindow Data

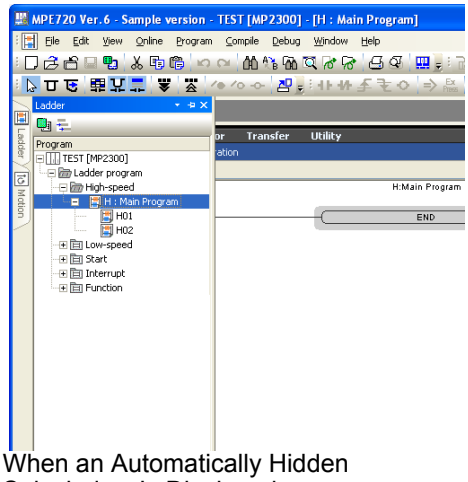
The data displayed in a Ladder, Motion, or Variable Subwindow can be updated either by selecting ***View - Update*** from the Main Menu or by pressing the **F5** Key.

- The above operations update comment lists as well. (Refer to *5.7 Comment Lists*.)

1.6.4 Types of Subwindow Displays

The following illustration shows the three types of subwindow displays.





When an Automatically Hidden Subwindow Is Displayed

Subwindows can be displayed in the following three ways:

1. Floating

Displayed apart from the **MPE720 Ver.6** Window. Can be freely moved by dragging the task bar.

2. Docked

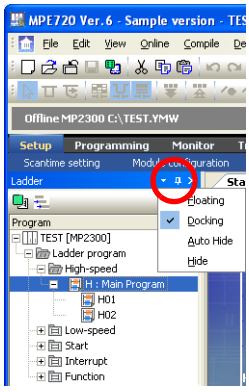
This is the subwindow display type when MPE720 version 6 is first started after being installed. Multiple subwindows are displayed on top of each other just like the main windows. The top subwindow can be changed by clicking the tabs.

3. Automatically Hidden

The subwindow slides out from the side when the relevant tab is clicked, and closes when any location outside of the subwindow is clicked. As shown in the illustration to the left, it is displayed above the main window and below floating subwindows.

1.6.5 Changing the Subwindow Display Type

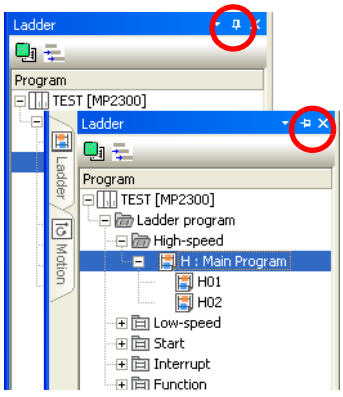
(1) Selecting from a Menu



In a subwindow with the **Menu** Button (▼) displayed in the title bar, click the **Menu** Button to display the menu as shown in the illustration on the left. Then select the new type of display on this menu.
To hide the subwindow, select ***Hide*** on the menu.

- To again display a subwindow that has been hidden, select the subwindow to be displayed from the ***View*** Menu. (Refer to *1.6.1 Descriptions of Subwindow Components.*)

(2) Changing from a Docked to an Auto Hide Subwindow



In a subwindow with the **Automatic Hide** Button (or) displayed in the title bar, click this button to toggle between the docked and automatically hidden subwindows.

: Docked → Auto Hide

: Auto Hide → Docked

- The form of the **Automatic Hide** Button switches each time it is clicked.
- If multiple subwindows are displayed on top of each other, all of the subwindows become displayed as auto hide subwindows.
- The **Automatic Hide** Button is not displayed in floating subwindows.

(3) Changing the Display Type by Dragging and Dropping

A docked subwindow can be changed to a floating subwindow or vice versa by dragging and dropping a subwindow tab or title bar.

- An auto hide subwindow cannot be changed to another display type by dragging and dropping.

[a] Changing from Docked to Floating

- The title bar of a docked subwindow is double-clicked the display type is changed to floating.
- When a docked subwindow tab or title bar is dragged and dropped in any location, a floating subwindow is displayed in that location.
- When the title bar of a docked subwindow is dragged and dropped when multiple subwindows are stacked, the display type is changed to floating with the multiple subwindows stacked in the same way.

[b] Changing from Floating to Docked

- When the title bar of a floating subwindow is double-clicked, the subwindow will be docked in the original docked position.
- A floating subwindow can be moved to a desired position by dragging the tab or title bar to the left, right, top, or bottom of the main window and releasing the mouse button where the direction icons (◀, ▲, ▶, or ▼) are displayed.
  - A docked subwindow is not allowed on the same side as an auto hide subwindow.
- When a floating subwindow tab or title bar is dragged and dropped when multiple subwindows are stacked, the display type is changed to docked with the subwindows stacked in the same way.

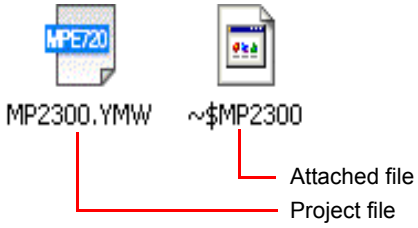
1.7 Project Files

1.7.1 What Is a Project File?

A project file is an application file used for MPE720 version 6 and is configured of the following files.

- **System Configuration Files**
  - System Definitions
  - Scan Time Definitions
  - Module Configuration Definitions
  - Data Trace Data
- **Program Files**
  - Ladder programs: High-speed, Low-speed, Start, Interrupt, and Function
  - Motion programs: Main, Sub, and Group definitions
  - Table data
  - Variables: Axis, I/O, Global, Constant, and User structure
  - Comments: I/O, Global, and Constant
- **Register Files**
  - M (Data registers), D (Internal registers), C (Constant registers), S (System registers), I (Input registers), and O (Output registers)

Project files keep these files together so that they can be managed as a single file in Windows. The file extension is YMW.
The above files can be edited when the project file is opened.
An attached file is displayed for an open project file, as shown below. This file indicates that the project file is open. When the project file is closed, the attached file is deleted.



Only one project file can be opened at a time for a single **MPE720 Ver.6** Window. In addition, the same project file cannot be opened in multiple **MPE720 Ver.6** Windows. If an attempt is made to open a project file that is already open, the **MPE720 Ver.6** Window for which the project file is open will be displayed in front.

1.7.2 Creating New Project Files

Use the following procedure to create a new project file.

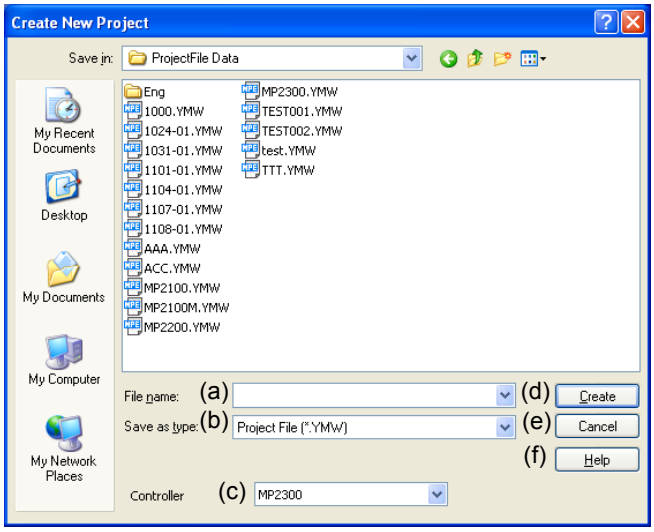
1. Start the operation in either of the following two ways.

- Click *New* under *Project* in the **Start** Window.
- Select ***File - Create New Project*** from the main menu.

In either case, the **Create New Project** Dialog Box will be displayed.

- If there is an edited file, a message will be displayed asking whether the file is to be compiled and saved. The results of clicking each of the buttons are described below.
  Yes: Compile, overwrite, and exit.
  No: Exit without compiling or saving.
  Cancel: Cancel the new project creation and continue editing.
- For details on closing a project file, refer to *1.7.6 Closing Project Files*.

2. Open the save destination folder, input the file name, and select the file type and the Machine Controller to be used.



The setting items and methods are as follows.

(a) File name
Enter a name for the project file to be saved.

(b) Save as type
Displays extensions of the project file that can be selected.
(Example) Project File (*.YMW)

(c) Controller
Select the type of Machine Controller to be used.

(d) Create
Click this button to create a file with the name entered in (a).

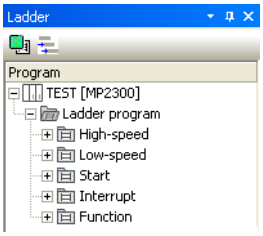
(e) Cancel
Click this button to cancel the Create New Project operation and close the Dialog Box.

(f) Help
Click this button to open the **Help Selection** Dialog Box.

- The following characters cannot be used in the file name: /, \, :, *, ?, ", <, >, or |.
- Either *Project Files(*.YMW)* or All Files(*.*) can be selected as the *Save as type*, but the project file (.YMW) will be created in either case.

3. Click the **Create** Button.

A message will be displayed notifying that “The project file will be created and opened.” The project file will be created in the specified folder and the new project file will be displayed in the Ladder Subwindow.



After the project file has been created, project file operations can be performed in the Ladder and Motion Subwindows.

- Refer to *1.8 Environment Settings* and *1.9.1 (1) Communications Settings* to make the required settings for the new project file.

After a project file has been created, configure the following settings.

- Communications settings (Refer to *1.9.1 Connecting to Machine Controllers*.)
- Module configuration settings (Refer to *2.1 Module Configuration*.)
- System settings (Refer to *1.8.7 Setup: System Setting*.)
- Scan settings (Refer to *1.8.8 Setup: Scan Time Setting*.)

In addition, configure the following settings as needed.

- User registration settings (Refer to *1.8.4 Security: User Registration*.)
- Default user settings (Refer to*1.8.6 Security: Default User Setting*.)

1.7.3 Opening Project Files

A project file can be opened using either of the following two methods.

- Open the project file in an **MPE720 Ver.6** Window that is already started.
- Start a new **MPE720 Ver.6** Window to open the project file.

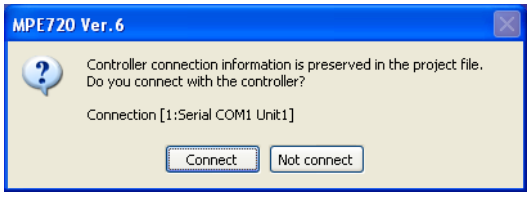
These two methods are described in detail on the following pages.

(1) Opening the Project File in an MPE720 Version 6 Window That Is Already Started

Execute any of the following operations to open a project file in the **MPE720 Ver.6** Window.

- Click a project file name displayed in *History* under *Project* in the ***Start*** Menu.
- Click ***File*** in the main menu, and select a project file from the file history displayed in the menu.
- Drag and drop a project file icon into an MPE720 window that is already started.
- Select ***File - Open Project*** from the main menu, and then select a project file in the **Project File** Dialog Box.
- Click *Open* under *Project* in the **Start** Window, and then select a project file in the **Project File** Dialog Box.

- If one of the above operations is executed when another project file is already open in the same window, the project file that was already open will be automatically overwritten and closed. For details on closing project files, refer to *1.7.6 Closing Project Files*.
- If the contents of *Communications Setting* are saved in the selected project file, the following dialog box will be displayed. (Refer to *1.9.1 Connecting to Machine Controllers*.)


MPE720 Ver.6
Controller connection information is preserved in the project file.
Do you connect with the controller?
Connection [1:Serial COM1 Unit1]
Connect
Not connect

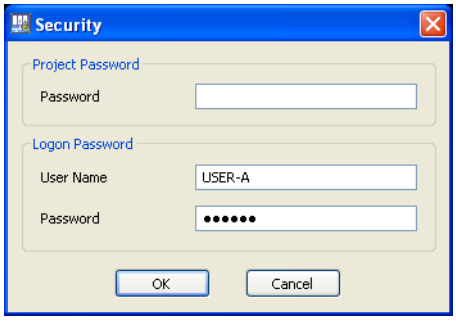
When the **connect** Button Is Clicked

The port set in the *Communications Setting* will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited and a save or exit operation is executed, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

When the **Not connect** Button Is Clicked

The selected project file will be opened in the **MPE720 Ver.6** Window.

- If a password has been set for the selected project file, the following **Security** Dialog Box will be displayed.



Enter the password that has been set, and then click the **OK** Button.

- For details on project file passwords, refer to *1.8.5 Security: Project Password*.

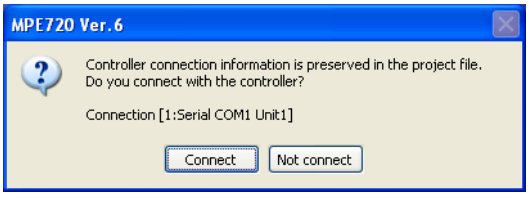
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(2) Starting a New MPE720 version 6 Window to Open a Project File

The following methods can be used to start a new **MPE720 Ver.6** Window and open a project file.

- Double-click the project file icon.
- Select the project file icon, right-click, and select ***Open*** from the pop-up menu that will be displayed.
- Drag and drop the **project file** Icon into the **MPE720 Ver.6** Icon.

- If the contents of *Communications Setting* are saved in the selected project file, the following dialog box will be displayed. (Refer to *1.9.1 Connecting to Machine Controllers*.)


MPE720 Ver.6
Controller connection information is preserved in the project file.
Do you connect with the controller?
Connection [1:Serial COM1 Unit1]
Connect
Not connect

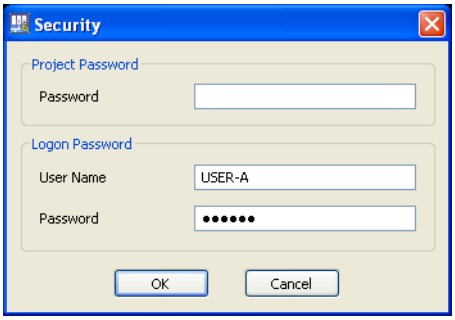
When the **Connect** Button Is Clicked

The port set in the *Communications Setting* will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited and saved, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

When the **Not connect** Button Is Clicked

The project file (on the computer) that was first selected will be displayed.

- If a password has been set for the selected project file, the following **Security** Dialog Box will be displayed.



Enter the password that has been set, and then click the **OK** Button.

- For details on project file passwords, refer to *1.8.5 Security: Project Password*.

1.7.4 Opening an MPE720 Version 5 MAL File

A MAL file (PLC folder compression file) that was created in MPE720 version 5 can be converted to a YMW file and opened using the following procedure.

- A PLC folder is compressed by selecting ***File - Transfer - Block Transfer - File Transfer [MPE720 to Media]*** in the MPE720 version 5 File Manager, and then selecting the *Compress* option in the **Execution Confirmation** Dialog Box.
- When MAL files are converted to project files, new ladder programs that were not compiled and saved will not be converted. Confirm that Verify All Programs has been executed in MPE720 version 5 before creating a MAL file.

1. Start MPE720 version 6.

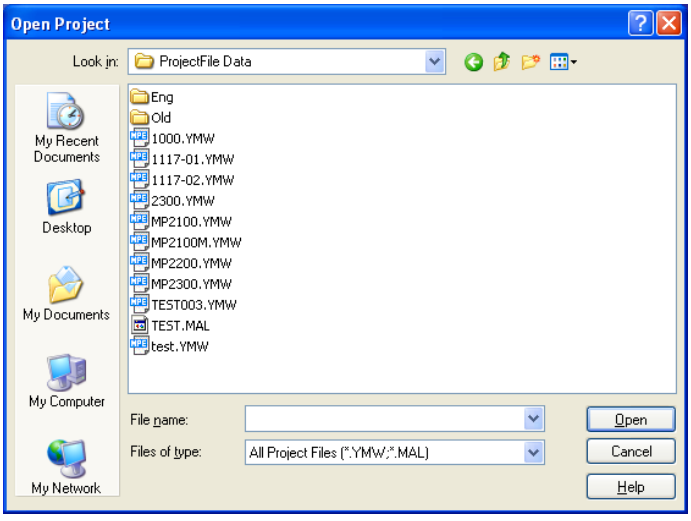
- For details, refer to *1.4.1 Starting MPE720 Version 6*.

2. Select ***File - Open Project*** from the Main Menu. Alternatively, select *Open* under *Project* in the **Start** Window.

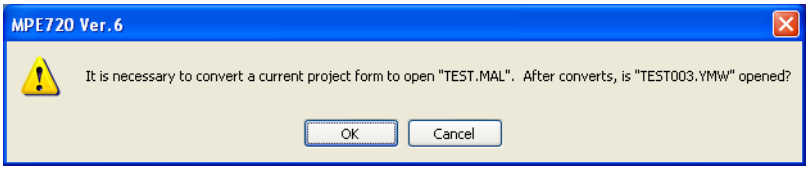
The **Open Project** Dialog Box will be displayed.

- A MAL file can be opened by dragging and dropping into an **MPE720 Ver.6** Window that is already open. If doing that, skip to step 4.

3. Select a file with an MAL extension, and click the **Open** Button.

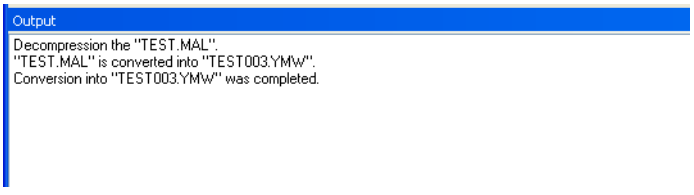


A message asking for confirmation will be displayed.


MPE720 Ver.6
It is necessary to convert a current project form to open "TEST.MAL". After converts, is "TEST003.YMW" opened?
OK
Cancel

4. Click the **OK** Button.

Conversion to a project file will begin, and a conversion log will be displayed in the Output Subwindow. When the conversion has been successfully completed, the message notifying that “Conversion has been completed.” will be displayed in the Output Subwindow.



1.7.5 Saving Project Files

A project file can be overwritten or save as a new file.

(1) Overwriting Project Files

1. Select ***File - Save Project*** from the Main Menu.

The edited project file will be overwritten after the message notifying that “The project file is being saved. Please wait for a minute.”

(2) Saving as Project File

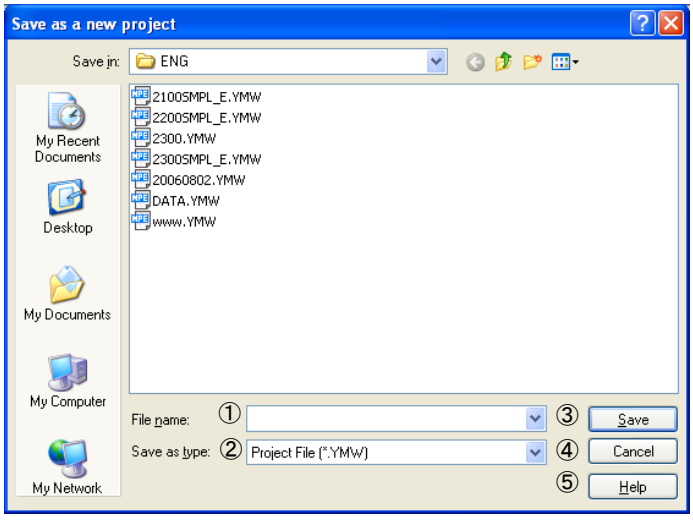
- If a saving error occurs while overwriting a project file.
  When overwriting a project file by executing the Save Project command, a saving error may occur. If an error occurs, the project file can be restored by renaming the following files with the extension “.YMW”.
  ***.YMW˜Backup: Backup of the project file before overwriting.
  ***.YMW~MW: Backup of the project file after overwriting.

1. Select ***File - Save as a new Project*** from the main menu.

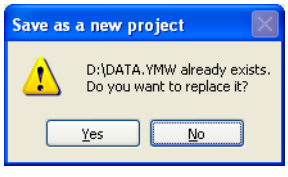
The **Save as a new Project** Dialog Box will be displayed.

2. Enter a project file name, and then click the **Save** Button.

- An existing project file can be opened if it is not opened by another computer running MPE720 version 6.

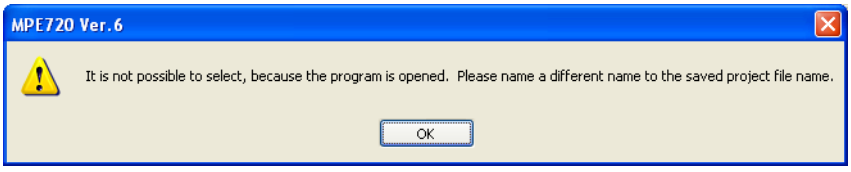


If a project file with the same name already exists in the specified folder, a message asking for confirmation to overwrite the existing file will appear.



Yes: The existing file is overwritten with the new project file and the selected name.
No: The project file is not saved, and the **Save as a new Project** Dialog Box will be displayed.

If the project file to be overwritten is opened by another MPE720 version 6, the following error message will appear and the file cannot be saved.


MPE720 Ver.6
It is not possible to select, because the program is opened. Please name a different name to the saved project file name.
OK

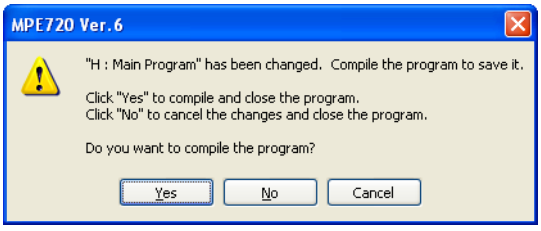
Click **OK** to return to the **Save as a new Project** Dialog Box.
Change the name of the project file or close the project file on the other computer and then save the project file.

1.7.6 Closing Project Files

To close an edited project file, either select ***File - Close Project*** from the main menu or click *Close* under *Project* in the **Start** Window.
The project file will be saved, and then the display will be disappeared from the subwindow. In addition, the attached file displayed while the project file is open will be deleted.
If MPE720 version 6 is closed without first closing a project file, the opened project file will be saved and closed.

If MPE720 version 6 is closed without first compiling an edited program, the following confirmation message will be displayed.

- If there are multiple programs that are not compiled, the message will be displayed once for each program.


MPE720 Ver.6
"H : Main Program" has been changed. Compile the program to save it.
Click "Yes" to compile and close the program.
Click "No" to cancel the changes and close the program.
Do you want to compile the program?
Yes
No
Cancel

Yes: After the applicable program has been compiled, it will be saved and closed. If a compile error occurs during the compiling, closing the project file will be cancelled as if the **Cancel** Button had been clicked and editing can be continued.
No: The applicable program will be closed without saving the changes.
Cancel: Closing the project file will be cancelled and editing can be continued. All programs closed up to that point, however, will remain closed.

When all uncompiled programs are closed, the project file will close.

If there is a connection to a Machine Controller when the project file is closed, the connection will be closed at the same time.

1.7.7 Moving Project Files: Deleting, Copying, and Renaming Project Files

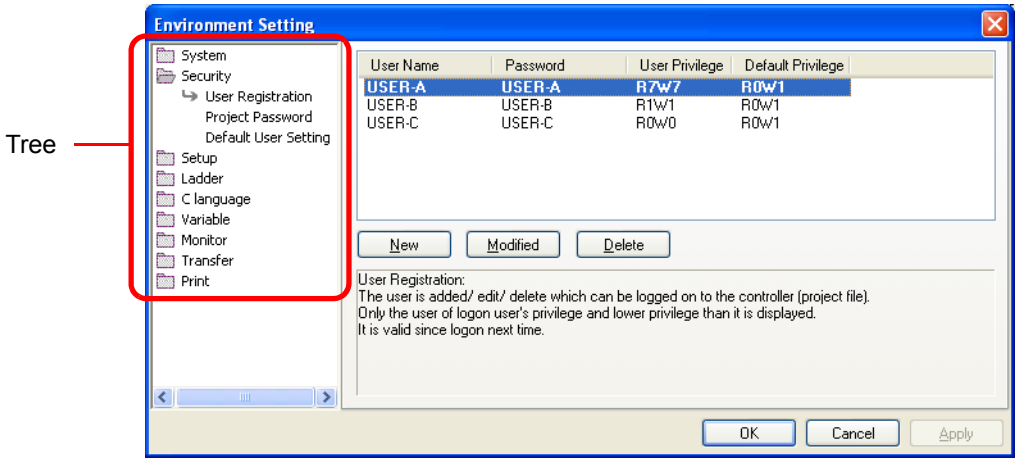
Just as with other Windows application files, operations such as moving project files to other folders or deleting, copying, or renaming project files can be executed using a file manager tool such as Explorer.
Shortcut keys, such as Ctrl+C (copy), Ctrl+X (cut), and Ctrl+V (paste) can also be used.

1.8 Environment Settings

The environment settings required for project files can be made in the **Environment Setting** Dialog Box.

1.8.1 Environment Setting Dialog Box

The **Environment Setting** Dialog Box will be displayed as shown below by selecting ***File - Environment Setting*** from the Main Menu.



The following settings can be made by selecting items from the tree. (*Controller Type* is for reference only.)

- An asterisk (*) is displayed next to any item for which the setting has been changed after the **Environment Setting** Dialog Box is opened.

System
- Communications Settings (Refer to *1.8.2 System: Communication Setting*.
- Controller Type (For reference only. Refer to *1.8.3 System: Controller Type*.)

Security
- User Registration (Refer to *1.8.4 Security: User Registration*.)
- Protect Password (Refer to *1.8.5 Security: Project Password*.)
- Default User Settings (Refer to *1.8.6 Security: Default User Setting*.)

Setup
- System Settings (Refer to *1.8.7 Setup: System Setting*)
- Scan Time Settings (Refer to *1.8.8 Setup: Scan Time Setting*.)

Ladder
- General (Refer to *1.8.9 Ladder: General*.)

C language
- General (Refer to *1.8.10 C Language: General*.)
- Linker (Refer to *1.8.11 Transferring C Language: Linker*.)

Variables
- Variables (Refer to *1.8.12 Variable: Variable*.)

Monitor
- System Monitor (Refer to *1.8.13 Monitor: System Monitor*.)

Transfer
- Transfer (Refer to *1.8.14 Transfer: Transfer*.)
- MP Loader (Refer to *1.8.15 Transfer: MPLoader*.)

Print
- Ladder (Refer to *1.8.16 Print: Ladder*.)

The following operations are executed by clicking the buttons.

When the **OK** Button is clicked:

The current settings are saved, the **Environment Setting** Dialog Box is closed, and any changes are reflected.

When the **Cancel** Button is clicked:

Changes to the settings are cancelled, and the **Environment Setting** Dialog Box is closed.

When the **Apply** Button is clicked:

Changes to the settings are overwritten and are immediately reflected. The **Environment Setting** Dialog Box remains open, allowing more settings to be made.

- Be careful when clicking the **Apply** Button or the **OK** Button. Clicking the **Apply** Button or the **OK** Button overwrites the setting the items of tree in the **Environment Setting** Dialog Box.

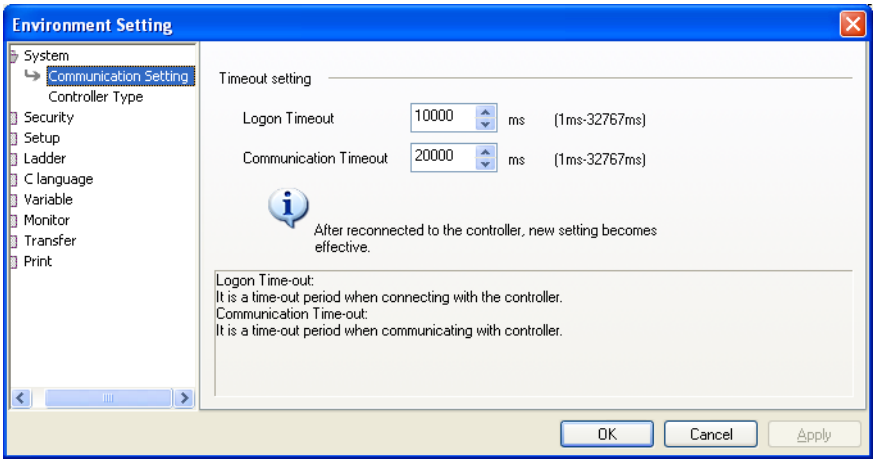
The methods for setting these items are described in detail below.

1.8.2 System: Communication Setting

The timeout can be set for connecting and communicating with the Machine Controller.

Select *System - Communications Setting* from the tree in the **Environment Setting** Dialog Box to bring up that window, and then change the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)

- Any changes made to the settings in this window will not be reflected until the next connection to the Machine Controller, even if the **Apply** Button is clicked.



Logon Timeout (1 ms to 32,767 ms)

Set the timeout time for when connecting to the Machine Controller. An error will occur if a connection is not completed within the set time after the connection operation has been started.

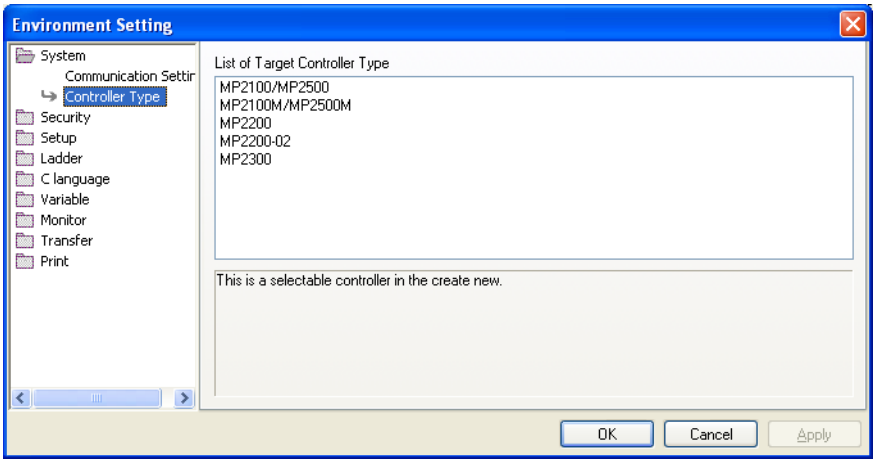
Communication Timeout (1 ms to 32,767 ms)

Set the timeout time for communications with the Machine Controller. An error will occur if communications are not restarted within the set time.

1.8.3 System: Controller Type

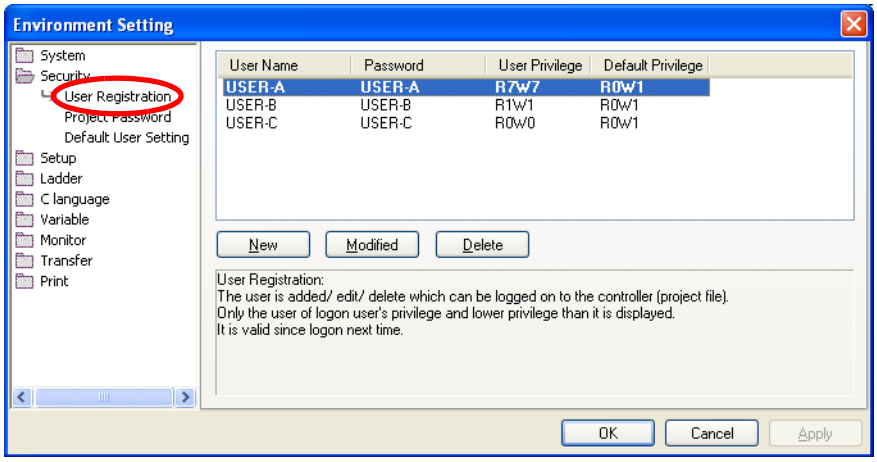
When a new project file is created, a list of Machine Controllers can be referenced that will be displayed in the Combo box.

Select *System* - *Controller Type* from the tree in the **Environment Setting** Dialog Box to bring up the following window for reference. (Refer to *1.8.1 Environment Setting Dialog Box*.) These settings cannot be changed.



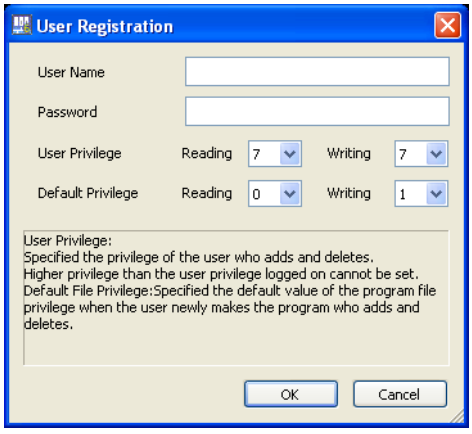
1.8.4 Security: User Registration

The users are allowed to open a project file can be registered and changed.
These settings can be made while the project file is open or while connected to the Machine Controller. If the settings are made while connected to the Machine Controller, they become the settings for access and writing rights to the Machine Controller.
Select *Security - User Registration* from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



(1) Registering New Users

Click the **New** Button in the User Registration Window. The **User Registration** Dialog Box will be displayed as shown below. Set each item, and then click the **OK** Button.



User Name: Enter a name using from 1 to 16 alphanumeric characters.
Password: Enter a password using from 1 to 16 alphanumeric characters.
User Privilege:

Select privilege levels of 0 to 7 for the user's reading and writing privileges. The higher the number, the greater the user's privileges will be.

- For details on reading and writing privileges, see *Reading and Writing Privileges* on the following pages.

Default Privileges

Set the privilege level to be set by default when the user creates a new program.

- Once a password has been set, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it, and that user will no longer be able to open the project file.

■ Reading and Writing Privileges

Reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit and save a program, the user must have a privilege level at least as high as the program's writing privilege level.

(2) Changing Registration Information

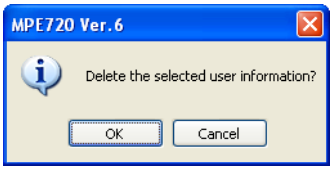
In the User Registration Window of the **Environment Setting** Dialog Box, select the user whose information is to be changed, and click the **Modified** Button. Set the required items in the **User Registration** Dialog Box that will be displayed, and click the **OK** Button. The user information will be changed.



- For details on the registration contents, refer to *Overwriting Project Files* on the previous page.
- If the default user has been selected, only the default privileges can be changed.
- For details on specifying the default user, refer to *1.8.6 Security: Default User Setting*.)

(3) Deleting User Registrations

In the **User Registration** Window of the **Environment Setting** Dialog Box, select the user whose information is to be deleted, and click the **Delete** Button. Then click the **OK** Button in the dialog box displayed for confirmation. The selected user information will be deleted.

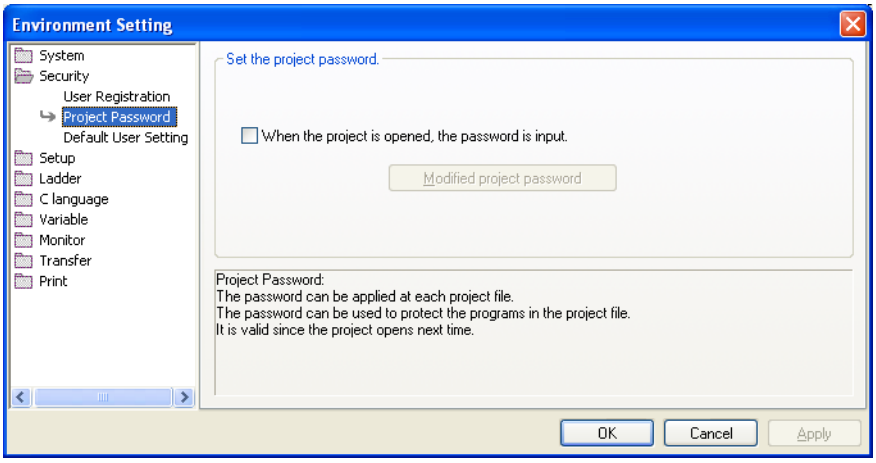


1.8.5 Security: Project Password

A password can be set for a project file that is currently open.

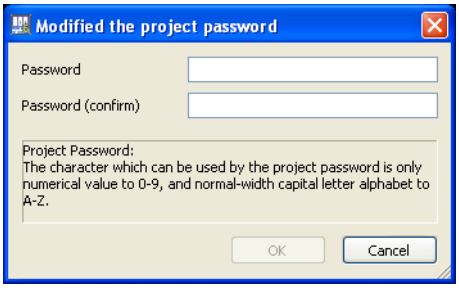
- Once a password has been set for a project file, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it that project file can no longer be opened.

Select ***Security - Project Password*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



(1) Registering and Changing Passwords

Select the ***When the project is opened, the password is input*** option in the Project Password Area, and then click the **Modified project password** Button. The **Modified the project password** Dialog Box will be displayed as shown below. Set each item, and then click the **OK** Button.


Modified the project password
Password
Password (confirm)
Project Password:
The character which can be used by the project password is only numerical value to 0-9, and normal-width capital letter alphabet to A-Z.
OK
Cancel

Password

Enter a new password using from 1 to 16 alphanumeric characters. No distinction is made between upper and lower case.

Password (confirm)

Enter the same password again for confirmation, and then press the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Password (Confirm)* Field.

(2) Deleting Passwords

To clear the password that has been set, clear the ***When the project is opened, the password is input*** option in the Project Password Area.

(3) Opening a Project File for Which a Password Has Been Set

When an attempt is made to open a project file for which a password has been set, the **Security** Dialog Box will be displayed as shown below.

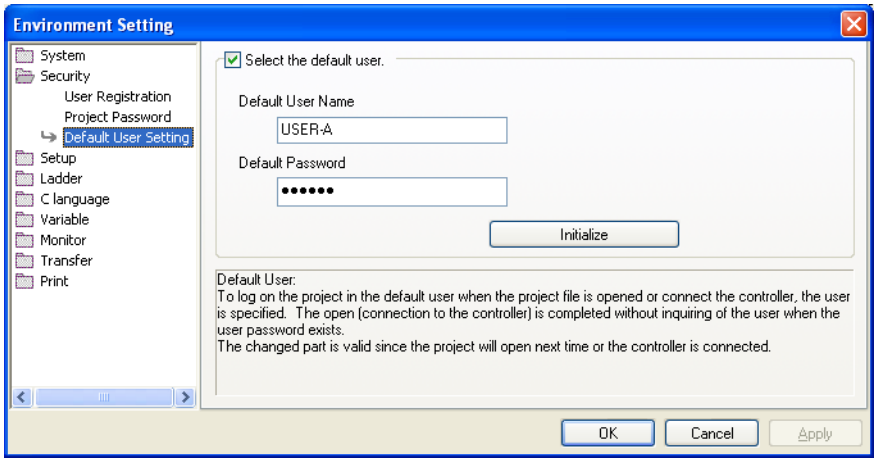


Enter the project password has been set, and then click the **OK** Button. The project file can then be opened.

1.8.6 Security: Default User Setting

A default user can be specified, and the default user name and password can be set.
When *Select the default user* is selected option, the default user information (user name and password) will be found when an attempt is made to open the project file. If the user registration settings are the same as the default user settings for the project file, then the project file can be opened without logging in. If the user settings are not the same, a dialog box will be displayed for logging in.

Select ***Security - Default User Setting*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



Select the Default User.

When this option is selected, the project file (or Machine Controller) can be accessed by the default user account.

Default User Name

Enter the default user name using from 1 to 16 alphanumeric characters.

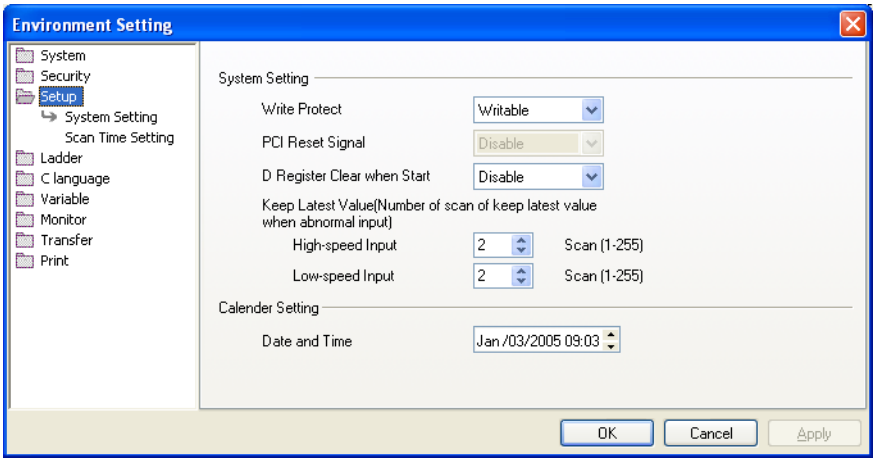
Default Password

Enter the default password using from 1 to 16 alphanumeric characters.

1.8.7 Setup: System Setting

System settings, such as those for program security and clearing of the D register at startup, can be made for program files that are currently being used.

Select ***Setup*** - ***System Setting*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



● System Settings

Write Protect

Select ***Writable*** or ***Not Writable*** to allow or prohibit the writing of program data to the Machine Controller. If ***Not writable*** is selected, data cannot be transferred to the Machine Controller and the program cannot be edited of compiled while connected, online, to the Machine Controller.

PCI Reset Signal (MP2100/2500 Only)

Select from *Enable* or *Disable* whether PCI reset signals of the MP2100/MP2500 are to be valid or invalid.

D Register Clear when Start

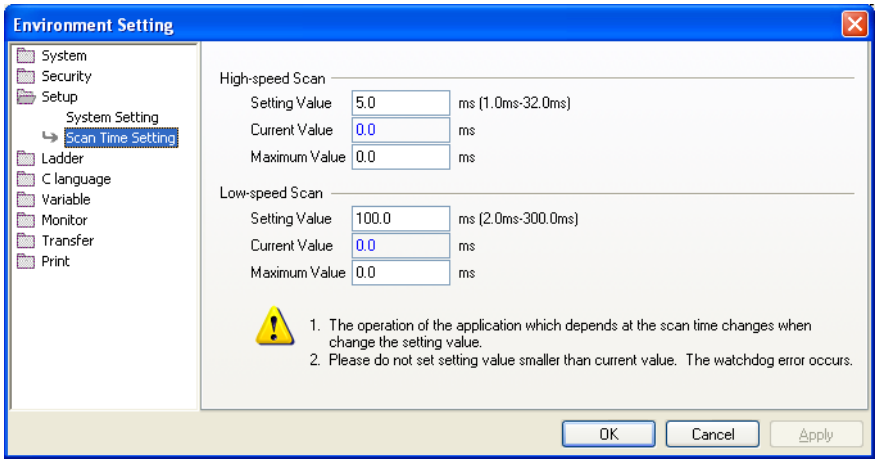
Select from *Enable* or *Disable* whether or not the D registers are to be cleared when the Machine Controller is started. If *Disable* is selected, the contents of the D registers in flash memory will be read to RAM.

Keep Latest Value

Set a number from 1 to 255 to specify the number of previous input values to be stored for both the high-speed and low-speed scan when an I/O error occurs.

1.8.8 Setup: Scan Time Setting

The high-speed and low-speed scan times can be set.
Select ***System - Scan Time Setting*** from the tree in the **Environment Setting** Dialog Box or select ***Setup - Scan Time Setting*** from the Launcher to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



- High-speed Scan (1.0 ms to 32.0 ms)

  Setting Value

  Set the scan time for high-speed processing programs (H, Hxx, and Hxx.xx) in units of ms.

  Current Value

  If offline, 0.0 ms is displayed. If online, the value read from the scan data of the S register in the same way as the system monitor is displayed. The maximum current value displayed during monitoring is the higher one of that the maximum value read from the scan data of S register or the maximum value set by the user.

  Maximum Value

  The setting value can be changed within a specified range. While changing the maximum value for high-speed or low-speed scans, Clik **Apply** to start monitoring.

- Low-speed Scan (2.0 ms to 300.0 ms)

  Setting Value

  Set the scan time for low-speed processing programs (L, Lxx, and Lxx.xx) in units of ms.

  Current Value

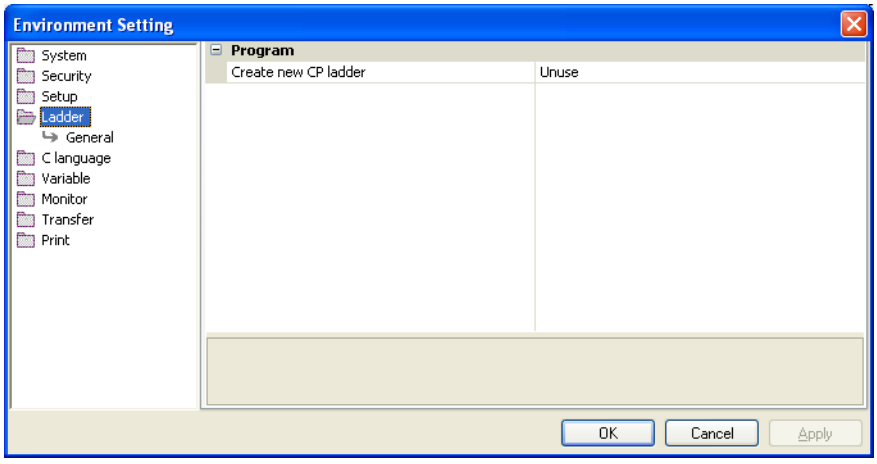
  If offline, 0.0 ms is displayed. When online, displays the value read from the scan data of the S register in the same way as the system monitor is displayed. The maximum current value displayed during monitoring is the higher one of that the maximum value read from the scan data of S register or the maximum value set by the user.

  Maximum Value

  The setting value can be changed within a specified range. While changing the maximum value for high-speed or low-speed scans, Click **Apply** to start monitoring.

1.8.9 Ladder: General

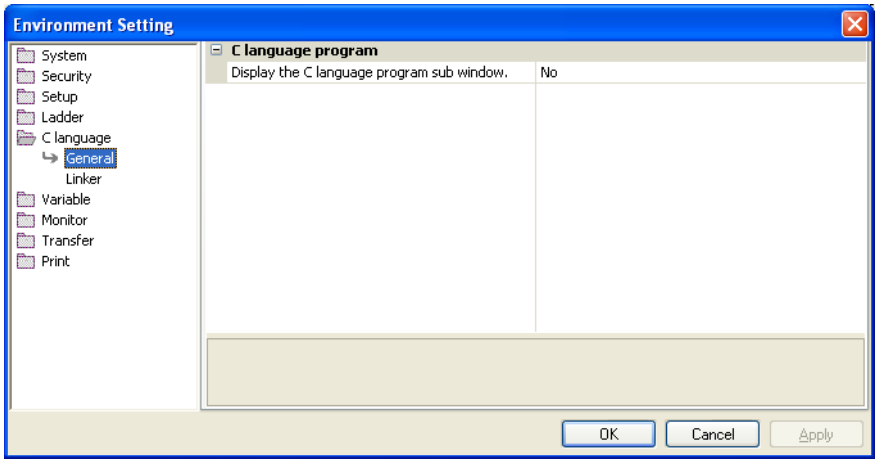
This option can be specified whether *Create new CP ladder* option is to be displayed in Ladder Subwindow popup menus.
Select ***Ladder - General*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



- Even if *Create new CP ladder* option is selected to *Not Use*, the Engineering Manager can still be used to create programs in the *CP* form. For details, refer to *3.2.2 (2) Creating New Programs from the Engineering Manager*.

1.8.10 C Language: General

This option can specify whether ***Display C language program sub window*** option is to be displayed in Language Sub-window pop-up menus.
Select ***C language - General*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)

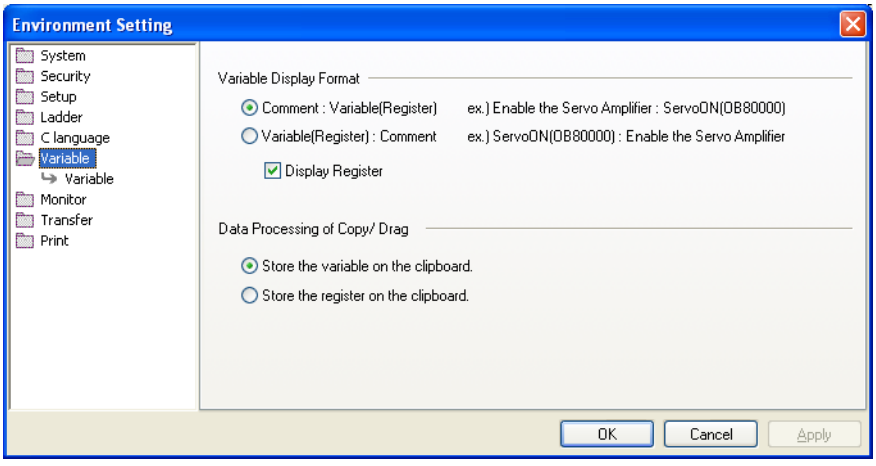


1.8.11 Transferring C Language: Linker

Linker is a program that can be used to link to objects produced by compiling. A support contract with Yaskawa is required to use this function.

1.8.12 Variable: Variable

These options can be used to set the variable display format in the Variable and Local Variable Subwindows and to make settings related to data processing when copying and dragging items from the Variable Subwindow.
Select ***Variable - Variable*** from the tree in the **Environment Setting** Dialog Box to bring up that window and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



● Variable Display Format

Comment: Variable (Register)
When this option is selected, variables in the Variable Subwindow are displayed in the *Comment: Variable (Register)* format.

Variable (Register): Comment
When this option is selected, variables in the Variable Subwindow are displayed in the *Variable (Register): Comment* format.

Display Register
When this option is cleared, *(Register)* is no longer displayed for the two variable formats above.

Example:
The format reflecting the settings for the above three items is displayed.

● Data Processing of Copy/Drag

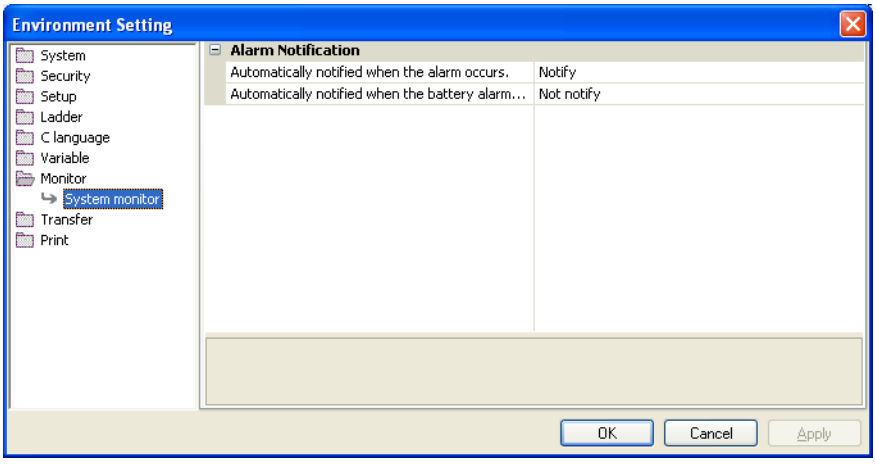
Store the Variable on the Clipboard
When this option is selected, variables are stored on the clipboard when copied or dragged from the Variable Subwindow to objects.

Store the Register on the Clipboard
When this option is selected, registers are stored on the clipboard when copied or dragged from the Variable Subwindow to objects.

- Differences in the above processing result in display differences, e.g., when copying and pasting variables from the Variable Subwindow to the Watch Subwindow. (With variables, the variable name is pasted, and with registers, the register number is pasted.) In addition, when copying and pasting to external applications such as memo pads, the same differences will occur.

1.8.13 Monitor: System Monitor

This option can be used to set the display method for the System Monitor Subwindow. (Refer to *6.2.5 System Monitor*.) Select ***Monitor - System Monitor*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



- Alarm Notification

  Automatically Notified when the Alarm Occurs

  When ***Notify*** is selected, the System Monitor Subwindow is automatically displayed when an alarm occurs.

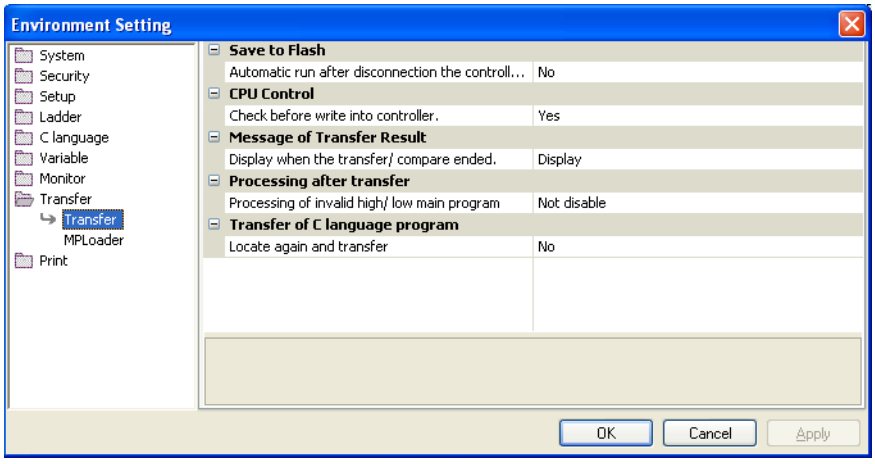
  Automatically Notified when the Battery Alarm Occurs

  This function is valid when *Automatic notification when an alarm occurs* (above) is set to ***Notify***.

  When ***Notify*** is also selected, the System Monitor Subwindow is automatically displayed when a battery alarm occurs.

1.8.14 Transfer: Transfer

Detailed settings can be made for data transfers with the Machine Controller.
Select ***Transfer*** - ***Transfer*** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



- Save to Flash

  Automatic Run after Disconnection the Controller

  When ***Yes*** is selected, project files in the Machine Controller RAM are saved to flash memory when the Machine Controller is disconnected.

- CPU Control

  Check before Write into Controller

  This function is valid when ***Individual*** is selected in the Transfer Program - Write into **Controller** Dialog Box. (Refer to *1.11.2 Writing to Machine Controllers*.)
  When ***Yes*** is selected, a message is displayed for confirmation before data is transferred to the Machine Controller.

- Message of Transfer Result

  Display when Transfer/Compare Ends

  When ***Yes*** is selected, a message is displayed for confirmation when a data transfer or comparison is completed.

- Processing After Transfer

  Processing of Invalid High/Low Main Program

  When ***Disable*** is selected, the main program (high-speed or low-speed) in the Machine Controller RAM is invalid when an error occurs during a batch data transfer to the Machine Controller, and the program is not executed even when the CPU is changed to RUN mode.

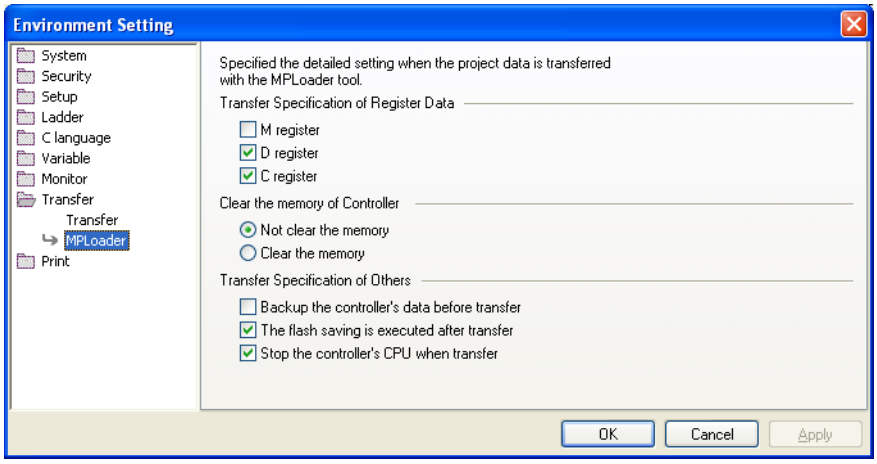
- Transferring C language programs

  Locate again and transfer

  A support contract with Yaskawa is required to use this function.

1.8.15 Transfer: MPLoader

Detailed settings can be made for data transfers with the Machine Controller.
As with MPE720 version 5, you can make detailed settings for data transfer to the Machine Controller using MPLoader. By setting the items described below, programs can be in the same. MAL file format of MPE720 version 5.
Select ***Transfer - MPLoader*** from the tree in the **Environment Setting** Dialog Box to bring up the window, and then make the settings. (Refer to *1.8.1 Environment Setting Dialog Box*.)



- Transfer Specification of Register Data

  M register
  When this check box is selected, M register data is transferred.

  D register
  When this check box is selected, D register data is transferred.

  C register
  When this check box is selected, C register data is transferred.

- Clear the Controller Memory

  Not clear the memory
  When this is selected, the memory will be cleared after transfer.

  Clear the memory
  When this is selected, the memory will not be cleared after transfer.

- Transfer Specification of Others

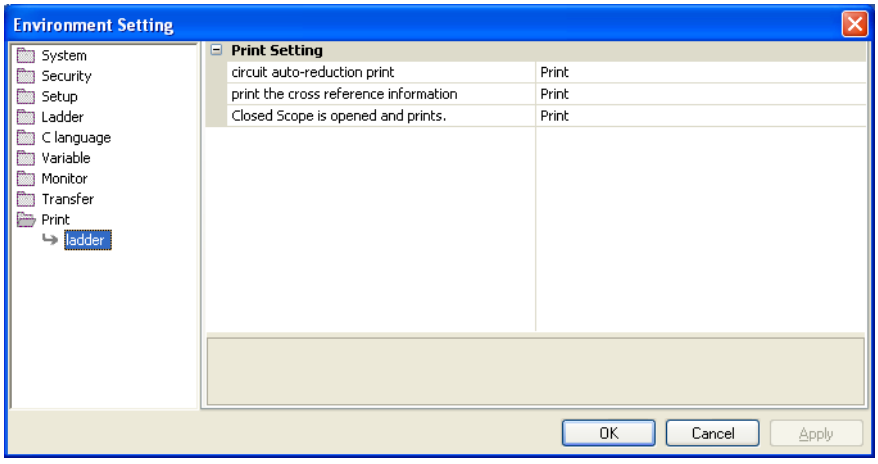
  Backup the controller data before transfer
  When this check box is selected, the data in the Machine Controller is backed up before transfer.

  The flash waving is executed after transfer
  When this check box is selected, the data will be saved to flash memory after transfer.

  Stop the controller's CPU during transfer
  When this check box is selected, the CPU in the Machine Controller is stopped when the transfer starts.

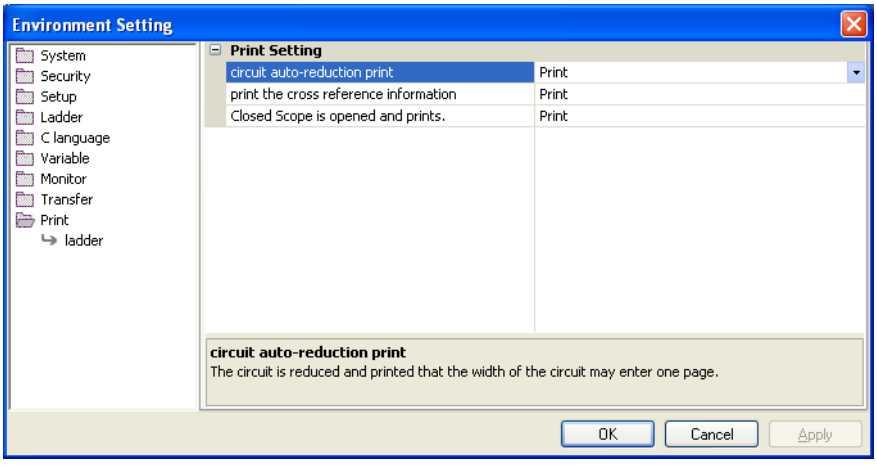
1.8.16 Print: Ladder

Select ***Print*** - ***Ladder*** from the tree in the **Environment Setting** Dialog Box. The following window will appear.



● Circuit Auto-reduction Print

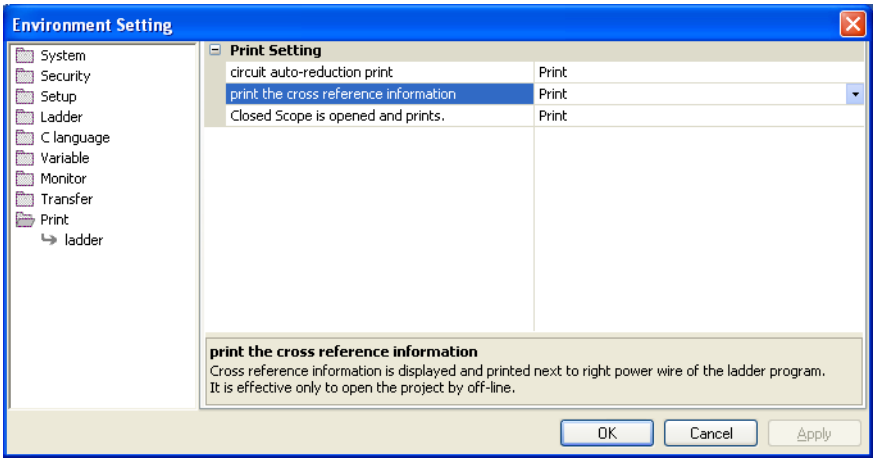
When **Print** is selected from the combo box, the rungs that cannot fit on one page will be reduced in width.



● Cross Reference

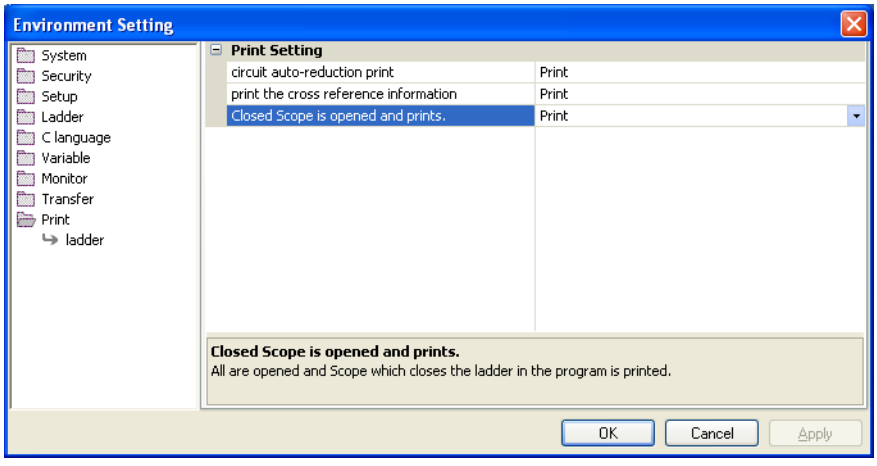
When ***Print*** is selected from the combo box, the cross reference information will be printed on the right side of the ladder program.

- When there are too many cross references to be printed, the distance between rungs will be automatically adjusted so that they will not run into one another. Thus, the ladder circuit and all the cross reference information can be printed.
- Refer to *10.1.4 Printing Cross-Reference Information* for details.



● Expand Collapsed Instructions

When ***Print*** is selected from the combo box, all ladder instructions will be expanded to show the details.



- Refer to *3.3.10 Inserting Instruction Objects* for information on Min/Max button of simplified display (scope).

1.9 Connecting to and Disconnecting from Machine Controllers

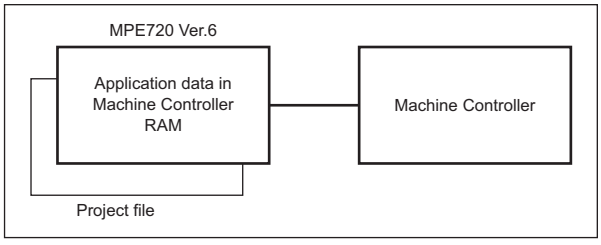
This section describes how to connect and disconnect communications between a computer running MPE720 version 6 and a Machine Controller.

1.9.1 Connecting to Machine Controllers

The MPE720 version 6 operations when connecting to a Machine Controller with connection data (Refer to *1.9.1 Connecting to Machine Controllers* for details on the settings in the **Communications Setting** Dialog Box.) are different from when opening a project file and other situations.

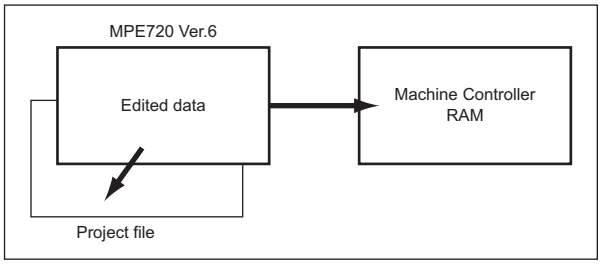
There are two ways to connect MPE720 version 6 and a Machine Controller:
Project Link Connection: Connects a Machine Controller to MPE720 version 6 with an open project file.
Direct Connection: Connects a Machine Controller to MPE720 version 6 without an open project file.
The following diagrams illustrate data transfer images.

・Connecting to the Machine Controller



When a connection is made to a Machine Controller with a project file open, the application data in the Machine Controller RAM is displayed in MPE720 version 6.

・Saving Data while Connected (when Compiled)



When a program is compiled while connected to a Machine Controller or when the connection is closed and the program is compiled, the edited data is written to both the Machine Controller RAM and the open project file.

Before connecting a MPE720 version 6 to a Machine Controller, the settings for the communication processing (refer to *1.3.5 Communication Process Settings*) and the settings for communications must be completed. The following section describes how to make the settings for communications.

(1) Communications Settings

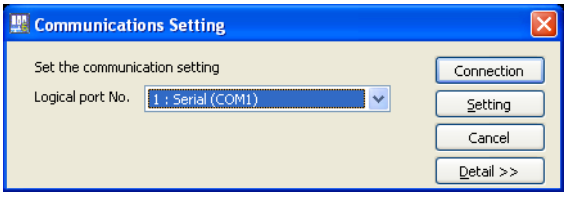
Configure the communications settings for the Machine Controller.

1. Select ***Online - Communications Setting*** from the Main Menu. Alternatively, click *Communications Setting* under *Controller* (or *Project*) in the Start Window.

The **Communications Setting** Dialog Box will be displayed.

2. Select the logical port number to be used for connecting to the Machine Controller and click the **Setting** Button.

- For details on the logical port numbers that are set, refer to *1.3.5 Communication Process Settings*.



The communications settings will be completed, and the dialog box will be closed.

- The **Connection** Button and the **Setting** Button are invalid while connected to the Machine Controller, and communications cannot be set.

(2) Project Link Connection

[a] Connecting from MPE720 Version 6 with an Open Project File

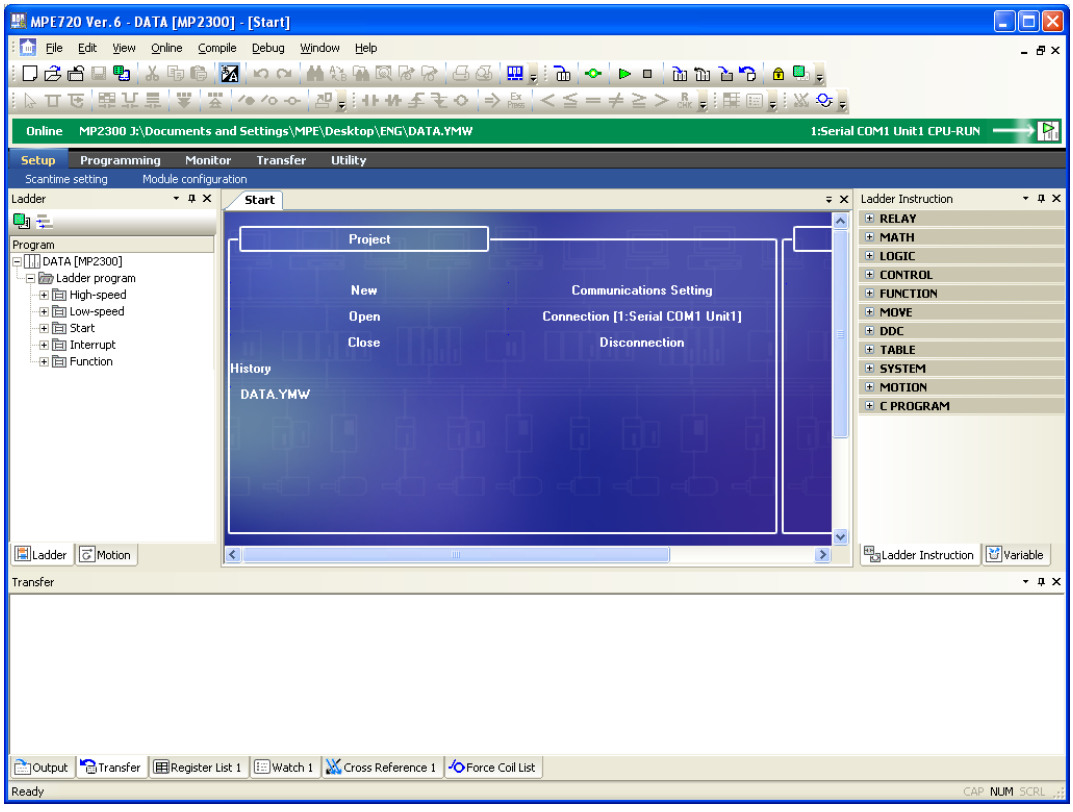
Connect to the Machine Controller as described below.

1. Any of the following operations can be used.

- Select ***Online*** - ***Connection*** from the Main Menu.
- Click ***Connection*** under ***Project*** in the Start Window.

The connection to the Machine Controller will be started. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.

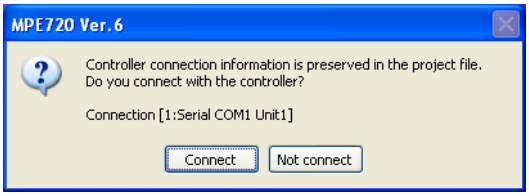
- When ***Disconnection*** is displayed by selecting ***Online*** from the Main Menu, the connection with the Machine Controller has been completed.



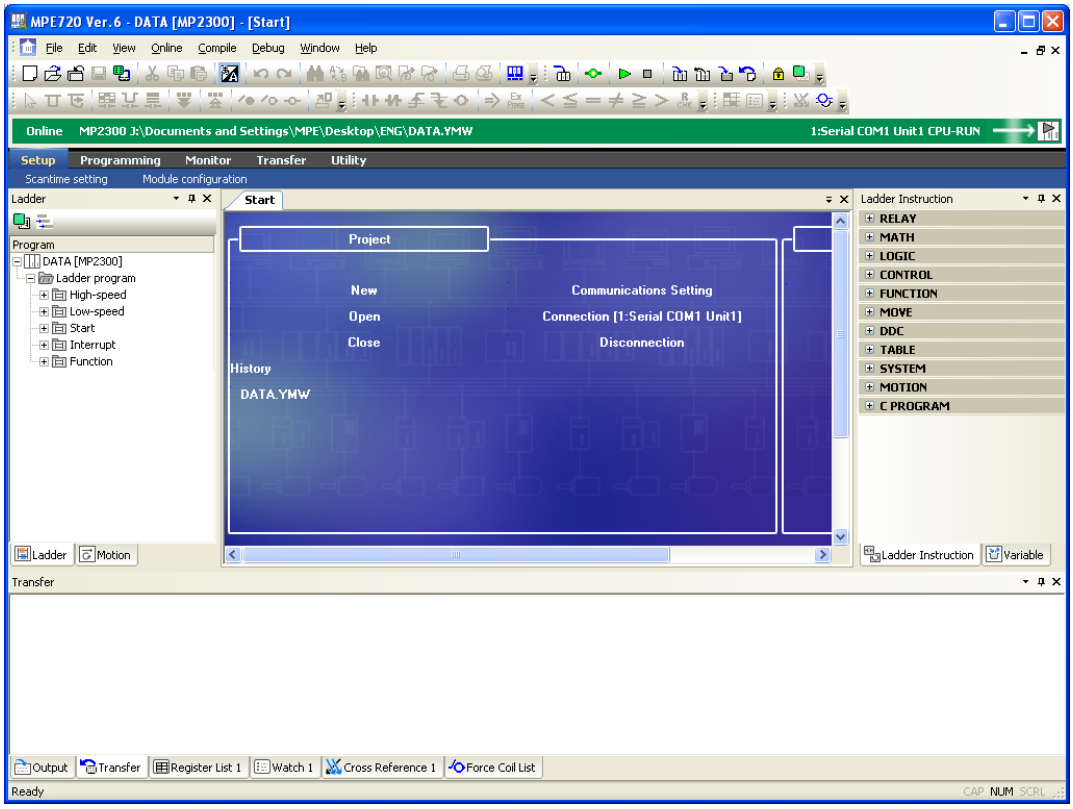
- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM. If the displayed ladder program is edited and saved (compiled), the changes will be overwritten in both the Machine Controller RAM and the open project file (on the computer). For details on saving data while connected, refer to *1.11.1 Overview of Data Transfers*.

[b] Opening a Project File Containing Connection Information

When the operation is executed to open a project file containing connection information, the following dialog box will be displayed for confirmation.


MPE720 Ver.6
Controller connection information is preserved in the project file.
Do you connect with the controller?
Connection [1:Serial COM1 Unit1]
Connect
Not connect

The connection to the Machine Controller will be started by clicking the **Connect** Button. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.



- If the **Not connect** Button is clicked, the project file will be opened without connecting to the Machine Controller.
- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM. If the displayed ladder program is edited and saved (compiled), the changes will be overwritten in both the Machine Controller RAM and the open project file (on the computer). For details on writing data while connected, refer to *1.11.1 Overview of Data Transfers*.

(3) Direct Connection

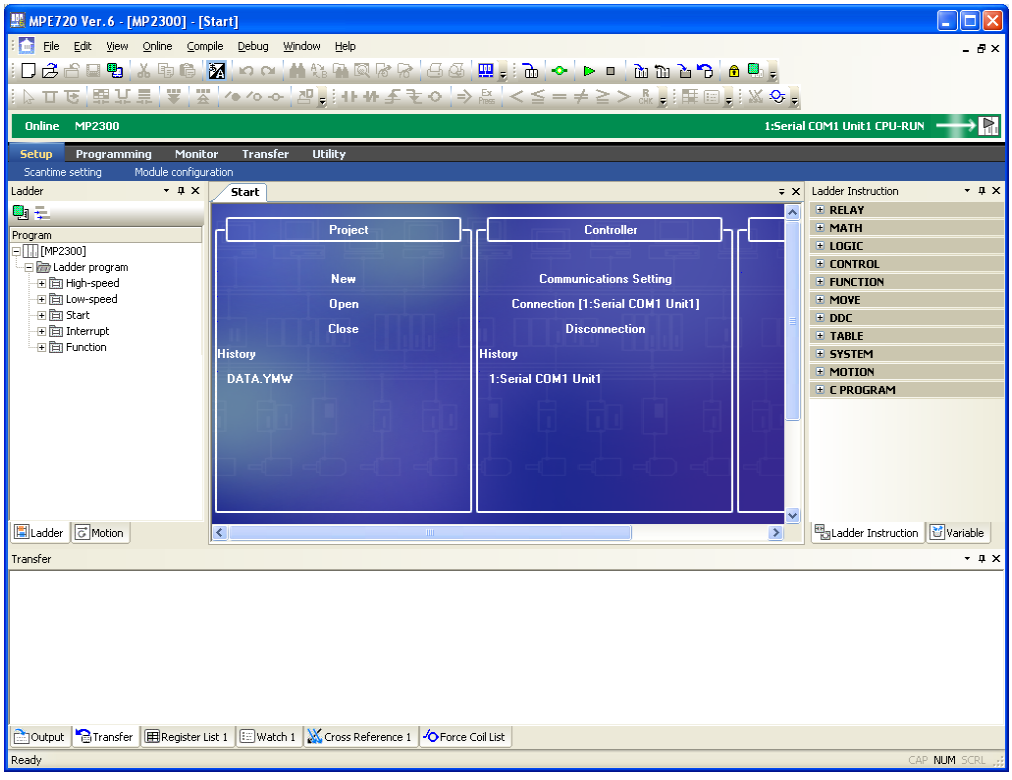
Connect to the Machine Controller as described below.

1. Any of the following operations can be used.

- Select ***Online - Connection*** from the Main Menu.
- Click *Connection* under *Controller* in the Start Window.
- Select from the connection histories displayed under *Controller - History* in the Start Window.

The connection to the Machine Controller will be started. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.

- When ***Disconnection*** is displayed by selecting ***Online*** from the Main Menu, the connection with the Machine Controller has been completed.



- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM, and it is not yet saved in the HDD of the computer. Refer to *1.11.5 Reading from Machine Controllers* and save the Machine Controller application data to a project file on the computer.

1.9.2 Disconnecting from Machine Controllers

The procedure for disconnecting a Machine Controller depends on whether or not a project file is open.

(1) When No Project File Is Open

1. Select ***Online - Disconnection*** from the Main Menu, or select *Disconnection* under *Controller* in the Start Window.

The connection to the Machine Controller will be closed, and the Ladder Subwindow will become blank.

- The connection is also closed by exiting MPE720 version 6.

(2) When a Project File Is Open

1. Select ***Online - Disconnection*** from the Main Menu, or select *Disconnection* under *Project* in the Start Window.

The connection to be Machine Controller will be closed, and a window will be displayed for the open project file.

- The connection is also closed when by exiting MPE720 version 6 or by closing the project file.

1.10 Stopping (STOP) and Restarting (RUN) the Machine Controller CPU

The CPU must be stopped when transferring data to the Machine Controller or when writing to the Machine Controller flash memory.
This section describes how to stop (STOP) and restart (RUN) the Machine Controller CPU.

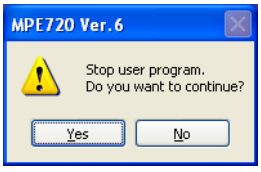
- This function is valid only while connected online to the Machine Controller.

1.10.1 Stopping Machine Controller CPU (STOP)

Use the following procedure to stop the CPU of a Machine Controller.

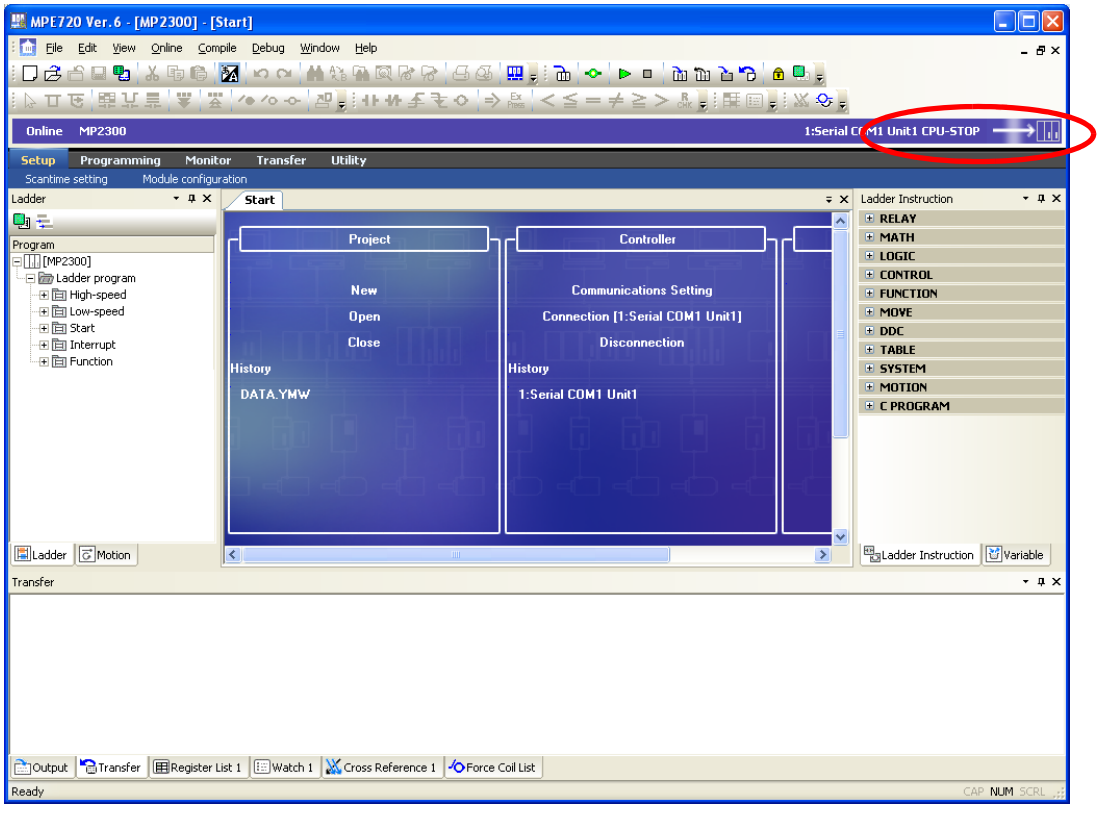
1. Select ***Online - CPU STOP*** from the Main Menu.

The following dialog box asking for confirmation will be displayed.



2. Click the **Yes** Button.

The display in the project caption bar will be changed to *CPU-STOP*. In addition, the color of the caption bar and the CPU status shown on the right side of the bar will be changed.



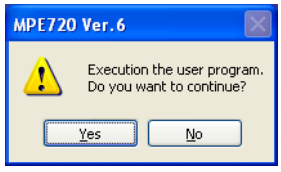
- CPU STOP can be set again even after it has been previously set by using this function. This is because of the possibility that multiple users may be connected simultaneously to the same Machine Controller, and that the CPU status may be changed by another user. Even if the CPU status is changed by another user, the CPU can be certainly stopped by setting CPU STOP.

1.10.2 Restarting Machine Controller CPU (RUN)

Use the following procedure to restart a Machine Controller CPU that has been stopped.

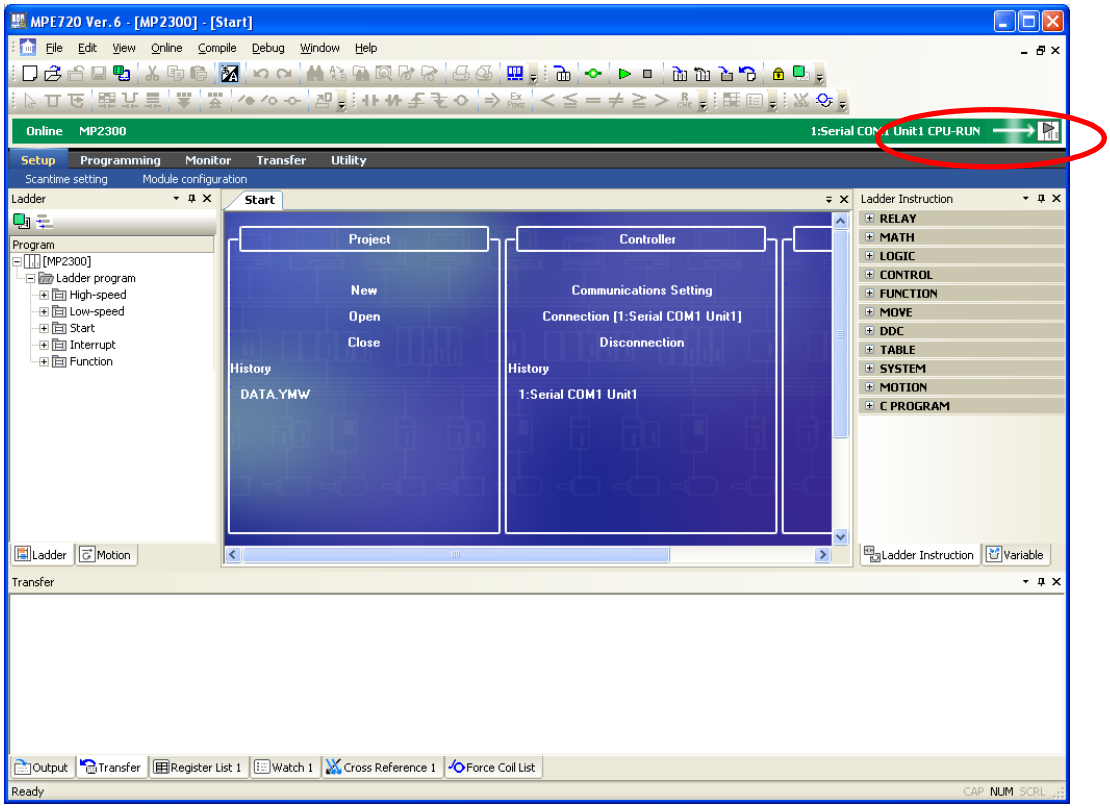
1. Select ***Online - CPU RUN*** from the Main Menu.

The following dialog box asking for confirmation will be displayed.



2. Click the **Yes** Button.

The display in the project caption bar will be changed to *CPU-RUN*. In addition, the color of the caption bar and the CPU status shown on the right side of the bar will be changed.



- CPU RUN can be set again even after it has been previously set by using this function. This is because of the possibility that multiple users may be connected simultaneously to the same Machine Controller, and that the CPU status may be changed by another user. Even if the CPU status is changed by another user, the CPU can be certainly restarted by setting CPU RUN.

1.11 Transferring Data

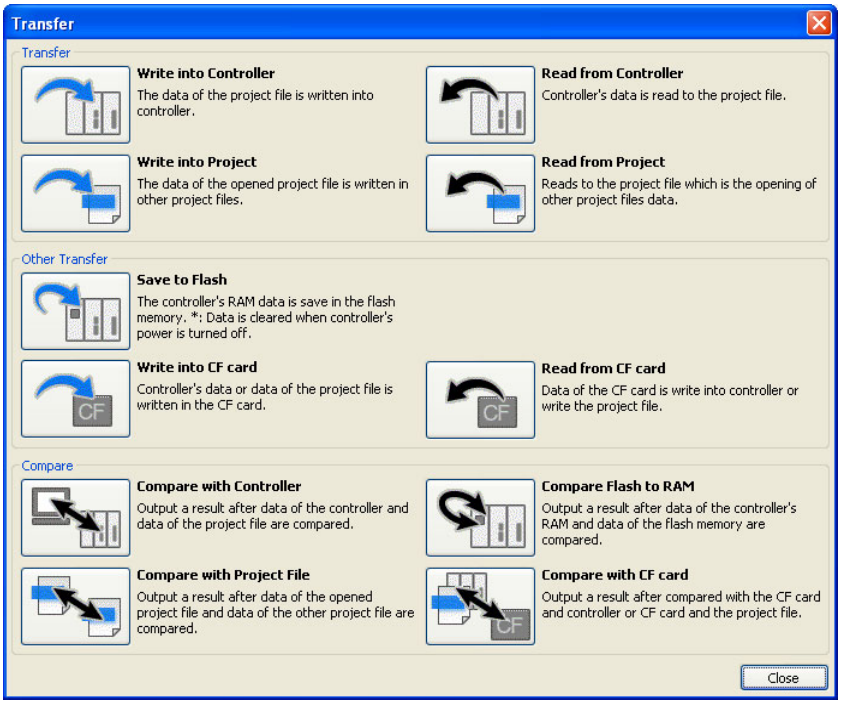
1.11.1 Overview of Data Transfers

A data transfer involves writing, reading, or comparing data between a computer running MPE720 version 6 and a Machine Controller, and saving the Machine Controller RAM data to flash memory.
The following types of data can be transferred.

- **System Configuration**
  - System Definitions
  - Scan Time Definitions
  - Module Configuration Definitions
  - Data Trace Data
- **Programs**
  - Ladder programs (High-speed, Low-speed, Start, Interrupt, Function)
  - Motion programs (Main, Sub, Group definitions)
  - Table data
  - Variables (Axis, I/O, Global, Constant, and User structure)
  - Comments (I/O, Global, and Constant)
- **Registers**
  - M (Data registers, D (Internal registers), C (Constant registers), S* (System registers), I* (Input registers), O* (Output registers)

* Registers marked by asterisks (*) cannot be written.

The type of data transfer can be specified by selecting ***Online - Transfer*** on the Main Menu, and then selecting the transfer type in the **Transfer** Dialog Box that will be displayed.


Transfer
Transfer
Write into Controller
The data of the project file is written into controller.
Read from Controller
Controller's data is read to the project file.
Write into Project
The data of the opened project file is written in other project files.
Read from Project
Reads to the project file which is the opening of other project files data.
Other Transfer
Save to Flash
The controller's RAM data is save in the flash memory. *: Data is cleared when controller's power is turned off.
Write into CF card
Controller's data or data of the project file is written in the CF card.
Read from CF card
Data of the CF card is write into controller or write the project file.
Compare
Compare with Controller
Output a result after data of the controller and data of the project file are compared.
Compare Flash to RAM
Output a result after data of the controller's RAM and data of the flash memory are compared.
Compare with Project File
Output a result after data of the opened project file and data of the other project file are compared.
Compare with CF card
Output a result after compared with the CF card and controller or CF card and the project file.
Close

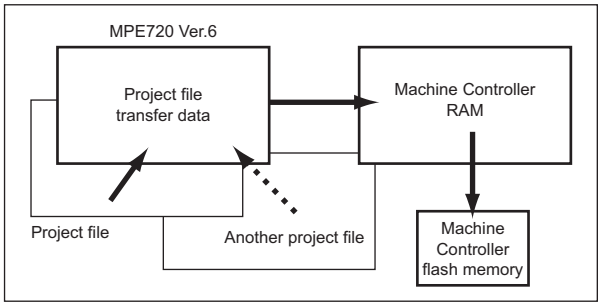
- For purposes of description, all of the icons in the above dialog box are shown as active.
- The transfer can also be executed by selecting ***Online*** - ***Write into Controller***, ***Read from Controller***, or ***Save to Flash*** from the Main Menu.

- The transfer can also be executed by selecting ***Transfer*** and then ***Write into Controller***, ***Read from Controller***, or ***Save to Flash*** from the Launcher.

The following diagrams illustrate the data transfer procedures using MPE720 version 6.

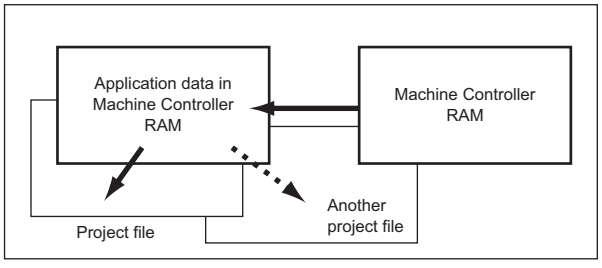
Data Transfers

1. Writing to the Machine Controller and Saving to Flash Memory



When *Write into Controller* is executed in the **Transfer** Dialog Box, data from the open project file (or another specified project file) is written to the Machine Controller RAM. When *Save to Flash* is executed, data in the Machine Controller RAM is written to the Machine Controller flash memory.

2. Reading from the Machine Controller



When *Read from Controller* is executed in the **Transfer** Dialog Box, data in the Machine Controller RAM is read to MPE720 version 6 and written to the open project file (or another specified project file).

The data transfer procedures are described in detail below.

1.11.2 Writing to Machine Controllers

The procedure differs as described below, depending on whether a project file is currently open.

- When a project file is open (Offline)
  The current project file data is transferred to the Machine Controller. When offline, first connect to the Machine Controller before the transfer.
- When a MPE720 is connected to the Machine Controller with a project file open: Project Link Connection
  If the **Write into Controller** Button in the **Transfer** Dialog Box is clicked, the **Open Project** Dialog Box will appear.
- When the connection is made without an open project file (Direct connection)
  The project file that is to be the transfer source is first selected, and then the data is transferred to the Machine Controller.

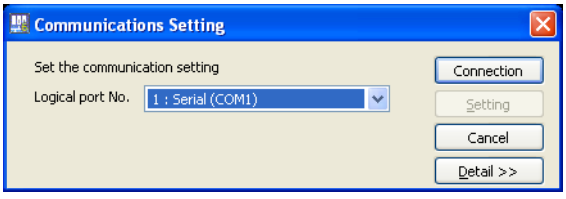
These methods are described in detail below.

(1) Offline with an Open Project File

1. Select ***Online - Transfer*** from the Main Menu, and click the **Write into Controller** Button in the Transfer Dialog Box that will be displayed.
Alternatively, select ***Online - Write into Controller*** from the Main Menu.
A third method is to select ***Transfer - Write into Controller*** from the Launcher.

If the project file does not contain connection information, or if the **Write into Controller** Button is clicked in the **Transfer** Dialog Box, the **Communications Setting** Dialog Box will be displayed.
In all other cases, the **Transfer Program - Write into Controller** Dialog Box shown in step 3 will be displayed.

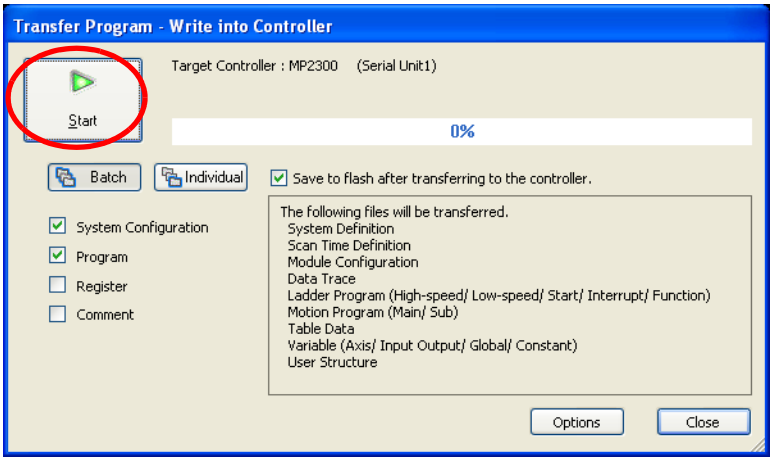
2. Select the port to be used for the transfer, and click the **Connection** Button.



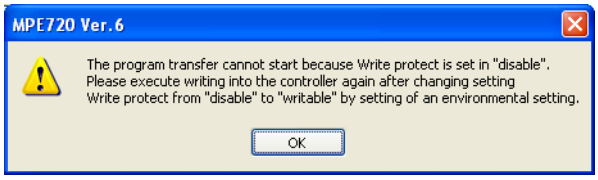
- With this procedure, connection information will not be written to the project file even when the **Connection** Button is clicked. To write connection information to the project file, select ***Online - Communications Setting*** from the Main Menu, and then make the settings in the Communications Setting Dialog Box that will be displayed.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.

3. Select *Batch* or *Individual*, and then click the **Start** Button.



- If writing to the Machine Controller is prohibited in the system settings (under ***Setup*** in the Environment Setting Window), a write error will occur when the **Start** Button is clicked, and the following message will be displayed. For details on system settings, refer to *1.8.7 Setup: System Setting*.


MPE720 Ver.6
The program transfer cannot start because Write protect is set in "disable".
Please execute writing into the controller again after changing setting
Write protect from "disable" to "writable" by setting of an environmental setting.
OK

When selecting *Batch*, select the types of data to be transferred from among *System Configuration*, *Program*, *Register,* and *Comment*.

- With a batch transfer, the Machine Controller RAM will be cleared before the transfer, and it will be updated by the project file data being transferred.

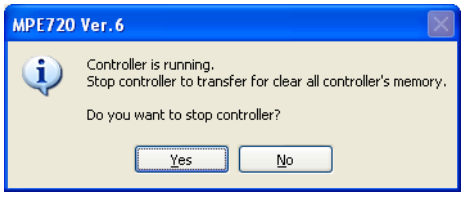
When *Individual* is selected, not only can *System Configuration*, *Program*, *Register* or *Comment* be specified, but also the particular data to be transferred.

- With an individual transfer, only the same file will be overwritten by the data being transferred.

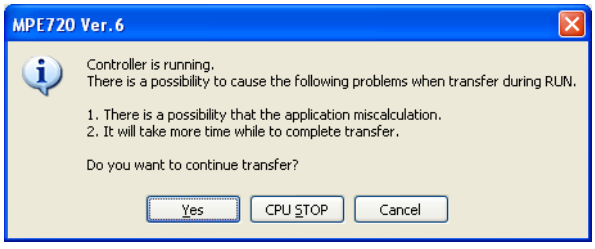
If *The flash saving is executed after transfer* is selected, the data will be saved to flash memory after being transferred to the Machine Controller RAM.

- For details on the data of the *System Configuration*, *Program*, *Register,* and *Comment* that is transferred, refer to *1.11.1 Overview of Data Transfers*.

If the CPU is in RUN status, one of the following messages will be displayed.



(a) When *Program* Is Selected for a Batch Transfer


MPE720 Ver.6
Controller is running.
There is a possibility to cause the following problems when transfer during RUN.
1. There is a possibility that the application miscalculation.
2. It will take more time while to complete transfer.
Do you want to continue transfer?
Yes
CPU STOP
Cancel

(b) Anything Other than the Above

(a) The transfer will be started by clicking the **Yes** Button.

(b) **Yes**: The data will be transferred without first stopping the CPU.

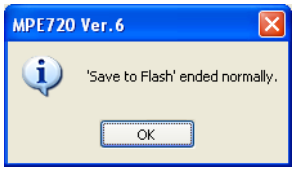
CPU STOP: The CPU will be stopped, and then the data will be transferred.

Cancel: The data will not be transferred.

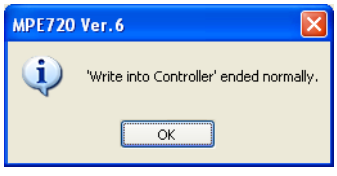
Writing to the Machine Controller will begin.

- If a writing error occurs, refer to *1.11.5 Reading from Machine Controllers* on how to take a corrective action.

When the transfer has been completed, one of the following messages will be displayed.

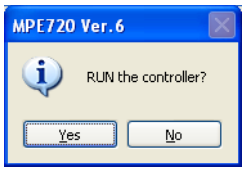


If *Save to Flash* Was Specified



If *Save to Flash* Was Not Specified

If the CPU was stopped, the following message will be displayed when the **OK** Button is clicked. Click the **Yes** Button to restart (RUN) the CPU and end the transfer, or click the **No** Button to end the transfer with the CPU stopped.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

(2) Connected Online with an Open Project File

1. Select ***Online - Write into Controller*** from the Main Menu.
Alternatively, select ***Transfer - Write into Controller*** from the Launcher.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.
The subsequent operations are the same as from step 3 onwards in *(1) Offline with an Open Project File*.

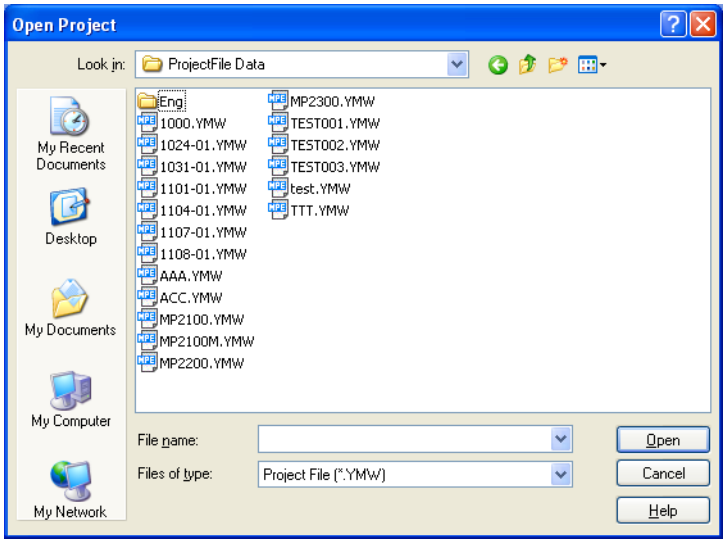
- The **Open Project** Dialog Box will be displayed when *Write into Controller* is selected from the Transfer Dialog Box, even while connected online with a project file open.

(3) Connected Online without an Open Project File

1. Select ***Online - Transfer*** from the Main Menu, and click the **Write into Controller** Button in the **Transfer** Dialog Box that will be displayed.
Alternatively, select ***Online - Write into Controller*** from the Main Menu.
A third method is to select ***Transfer - Write into Controller*** from the Launcher.

The **Open Project** Dialog Box will be displayed.

2. Select the project file that is to be transferred, and click the **Open** Button.



- Select a project file for which the Machine Controller type is the same as that of the currently connected Machine Controller.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.
The subsequent operations are the same as from step 3 onwards in *(1) Offline with an Open Project File*.

1.11.3 Program Disable Processing when a Write Error Occurs

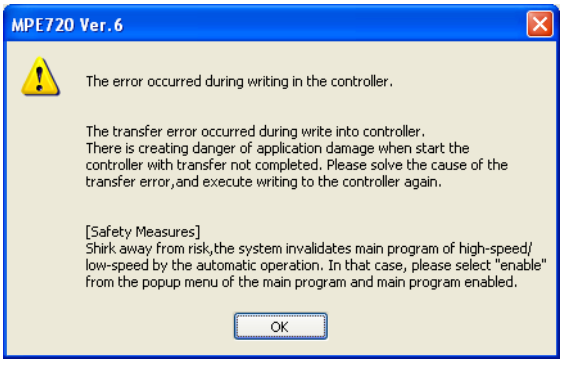
When data is transferred with the CPU stopped, a high-speed or low-speed main program may be invalid if the transfer fails (e.g., if there is an incompletely written program). When the CPU is restarted (RUN) after a transfer failure, there is a risk that an incompletely written program may be executed and the machinery may be damaged. This function can be set to eliminate this risk.

This function is valid only by selecting ***File - Environment Setting - Transfer*** from the Main Menu, and setting *Processing of invalid high/low main program* to *Disable*.

- For details on high-speed and low-speed main program disable processing, refer to *1.8.14 Transfer: Transfer*.

(1) When Processing of Invalid High/Low Main Program Is Disabled

When *Processing of invalid high/low main program* is set to *Disable* in the Transfer Window, the following error message will be displayed if an error occurs during a data transfer with the CPU stopped.


MPE720 Ver.6
The error occurred during writing in the controller.
The transfer error occurred during write into controller.
There is creating danger of application damage when start the controller with transfer not completed. Please solve the cause of the transfer error,and execute writing to the controller again.
[Safety Measures]
Shirk away from risk,the system invalidates main program of high-speed/ low-speed by the automatic operation. In that case, please select "enable" from the popup menu of the main program and main program enabled.
OK

If this message is displayed, the main ladder program (high-speed or low-speed) is invalid in the Machine Controller and will not be executed even if the CPU is restarted (RUN).

- Even under the above conditions, if there is a communications timeout or if a write error occurs due to not being able to communicate with the Machine Controller, the message below in (2) will be displayed and disable processing will not be executed.

(2) When High Processing of Invalid/Low Main Program Is Not Disabled

When *Processing of invalid high/low main program* is set to *Not Disable* in the Transfer Window, the following error message will be displayed if an error occurs during a data transfer with the CPU stopped.


MPE720 Ver.6
The error occurred during writing in the controller.
The transfer error occurred during write into controller.
There is creating danger of application damage when start the controller with transfer not completed. Please solve the cause of the transfer error,and execute writing to the controller again.
OK

If this message is displayed, the program will be executed when the CPU is restarted (RUN) even if the program is incompletely written. Before restarting the CPU, be sure to execute the data transfer again to ensure that the program in the Machine Controller is complete.

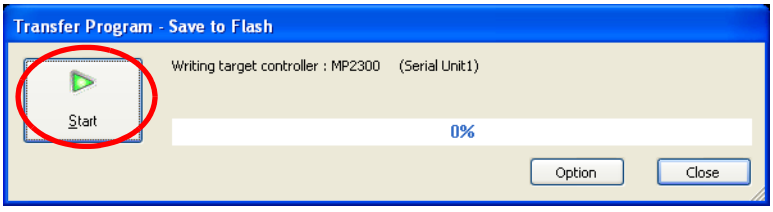
1.11.4 Saving to Flash Memory

This section describes how to save data in the Machine Controller RAM to the Machine Controller flash memory. This function is valid only while connected online to the Machine Controller.
The procedure is as follows :

1. Select ***Online - Transfer*** from the main menu, and click the **Save to Flash** Button in the **Transfer** Dialog Box.
Alternatively, select ***Online - Save to Flash*** from the main menu.
A third method is to select ***Transfer - Save to Flash*** from the Launcher.

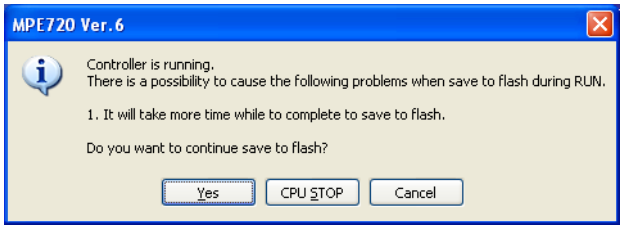
The **Transfer Program - Save to Flash** Dialog Box will appear.

2. Click the **Start** Button.



If the CPU is in RUN status, the following message will appear. Click either the **Yes** Button or the **CPU STOP** Button to start saving the data to flash memory.

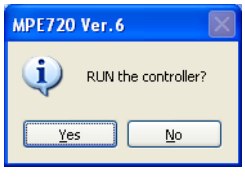
- If the **Yes** Button is clicked, the operation will take more time.


MPE720 Ver.6
Controller is running.
There is a possibility to cause the following problems when save to flash during RUN.
1. It will take more time while to complete to save to flash.
Do you want to continue save to flash?
Yes
CPU STOP
Cancel

When the save operation is completed, the following message will appear.



Click the **OK** Button. If the data was saved to flash memory with the CPU in RUN status, the operation will be finished.
If the data was saved to flash memory with the CPU stopped, the following message will appear.



If the **Yes** Button is clicked, the CPU will be restarted (RUN), and the save operation will be completed.
If the **No** Button is clicked, the save operation will complete with the CPU stopped.

1.11.5 Reading from Machine Controllers

The procedure differs as described below, depending on whether a project file is currently open.

- When a project file is open
  Data in the Machine Controller RAM is transferred to the project file that is currently open. When offline, first connect to the Machine Controller before the transfer.
- When the connection is made without an open project file
  After a project file is selected as the transfer destination, the data is then transferred from the Machine Controller.

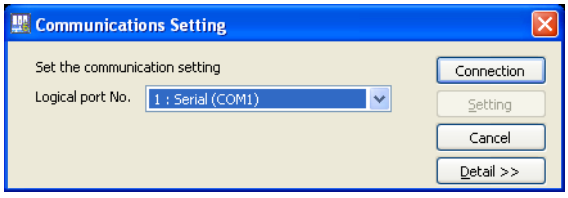
These methods are described in detail below.

(1) Offline with an Open Project File

1. Select ***Online - Transfer*** from the Main Menu, and click the **Read from Controller** Button in the Transfer Dialog Box that will be displayed.
Alternatively, select ***Online - Read from Controller*** from the Main Menu.

If the project file does not contain connection information, or if the **Read from Controller** Button is clicked in the **Transfer** Dialog Box, the **Communications Setting** Dialog Box will be displayed.
In all other cases, the **Transfer Program - Read from Controller** Dialog Box shown in step 3 will be displayed.

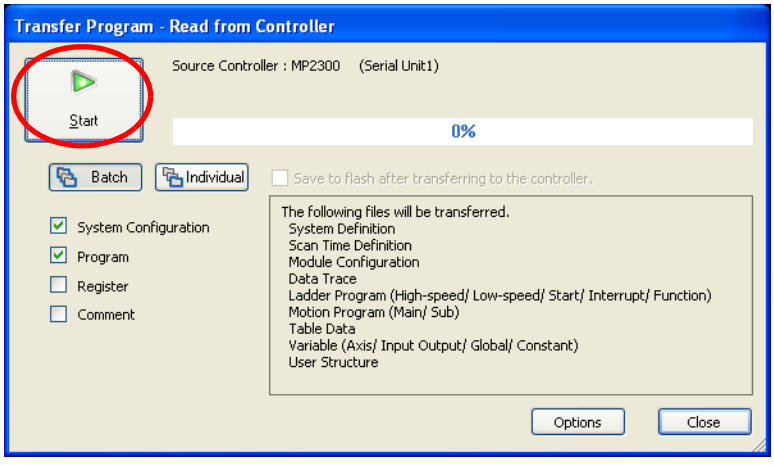
2. Select the port to be used for the transfer, and click the **Connection** Button.



- With this procedure, connection information will not be written to the project file even when the **Connection** Button is clicked. To write connection information to the project file, select ***Online - Communications Setting*** from the Main Menu, and then make the settings in the Communications Setting Dialog Box that will be displayed.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.

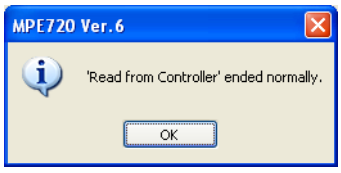
3. Select *Batch* or *Individual*, and then click the **Start** Button.



When selecting *Batch*, select the types of data to be transferred from among *System Configuration*, *Program*, *Register,* and *Comment*.
When *Individual* is selected, not only can *System Configuration*, *Program*, *Register,* or *Comment* be specified, but also the particular data to be transferred.

- For details on the data of the *System Configuration*, *Program*, *Register*, and Comment that is transferred, refer to *1.11.1 Overview of Data Transfers*.

Reading from the Machine Controller will be started.
When the transfer has been completed, the following message will be displayed. Click the **OK** Button to end the read operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

(2) Online with an Open Project File

1. Select ***Online - Read from Controller*** from the Main Menu.
Alternatively, select ***Transfer - Read from Controller*** from the Launcher.

The **Transfer Program - Read from Controller** Dialog Box will be displayed.
The subsequent operations are the same as from step 3 onwards in *(1) Offline with an Open Project File*.

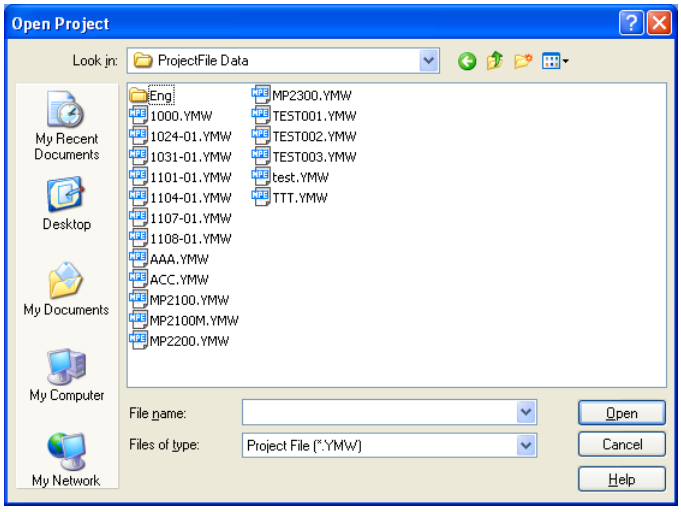
- The **Open Project** Dialog Box will be displayed when *Read from Controller* is selected from the **Transfer** Dialog Box, even while connected online with an open project file.

(3) Connected Online without an Open Project File

1. Select ***Online - Transfer*** from the Main Menu, and click the **Read from Controller** Button in the **Transfer** Dialog Box that will be displayed.
Alternatively, select ***Online - Read from Controller*** from the Main Menu.
A third method is to select ***Transfer - Read from Controller*** from the Launcher.

The **Open Project** Dialog Box will be displayed.

2. Either select the project file in which the data read from the Machine Controller is to be saved or Enter the name of a new project file to be created, and then click the **Open** Button.



- If a new project file is being created, the class of the currently connected Machine Controller will be set for that project file.

The **Transfer Program - Read from Controller** Dialog Box will be displayed.
The subsequent operations are the same as from step 3 onwards in *(1) Offline with an Open Project File*.

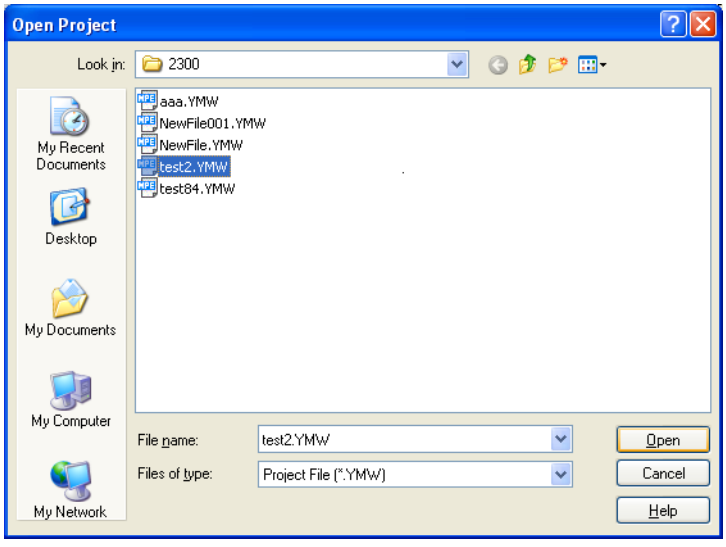
1.11.6 Writing into a Project File

Write the data in the open project file into another project file. This function is enabled when the MPE720 version 6 is not connected to the Machine Controller. This status is regarded as offline.
The procedure is as follows:

1. Select ***Online*** - ***Transfer*** from the main menu, and click the **Write into Project** Button in the **Transfer** Dialog Box.

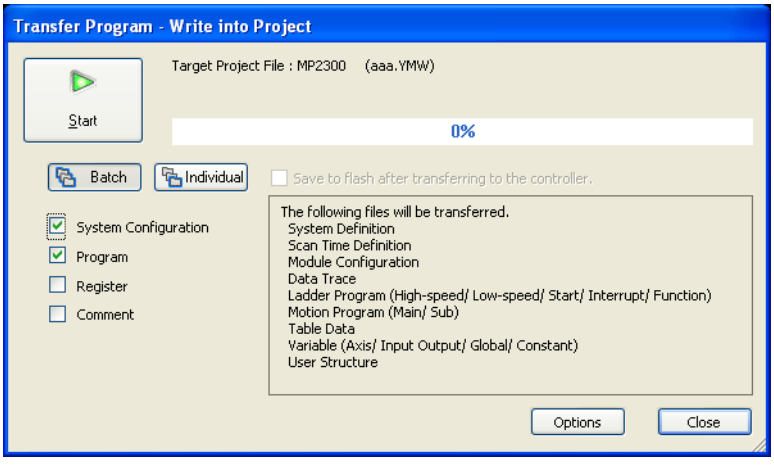
   The **Open Project** Dialog Box will appear.

2. Select the project file to be overwritten, and click **Open**.



   The **Transfer Program - Write into Project** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.

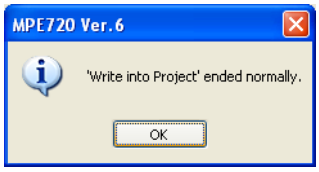


   When selecting the **Batch** or **Individual** Button, the types of data to be transferred (***System Configuration***, ***Program***, ***Register***, and ***Comment***) can be selected.
   When selecting the **Individual** Button, the particular data to be transferred can also be designated.

   - For details on the data of the ***System Configuration***, ***Program***, ***Register***, and ***Comment*** that is transferred, refer to *1.11.1 Overview of Data Transfers*.

   After clicking **Start**, the data will begin writing into the project file.

When the writing is complete, the following message will appear. Click **OK**.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

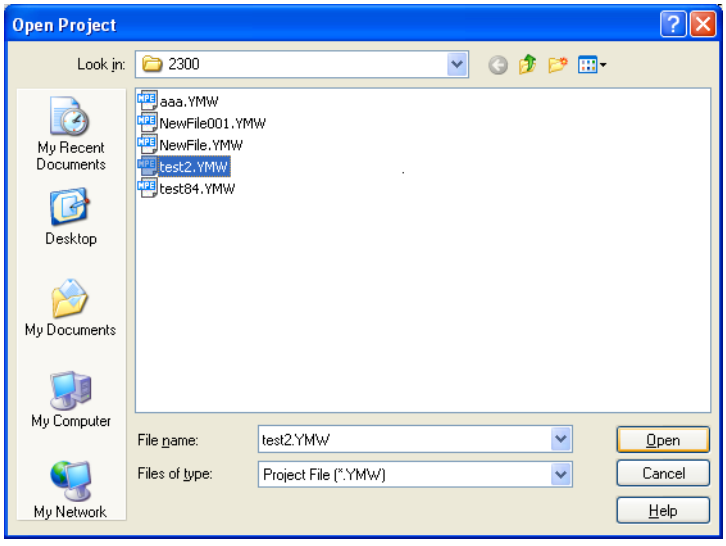
1.11.7 Reading from a Project File

The data will be read from the selected project file and written into the currently open project file. This function is enabled when the MPE720 version 6 is not connected to the Machine Controller (offline).
The procedure is as follows:

1. Select ***Online*** - ***Transfer*** from the main menu, and click the **Read from Project** Button in the **Transfer** Dialog Box.

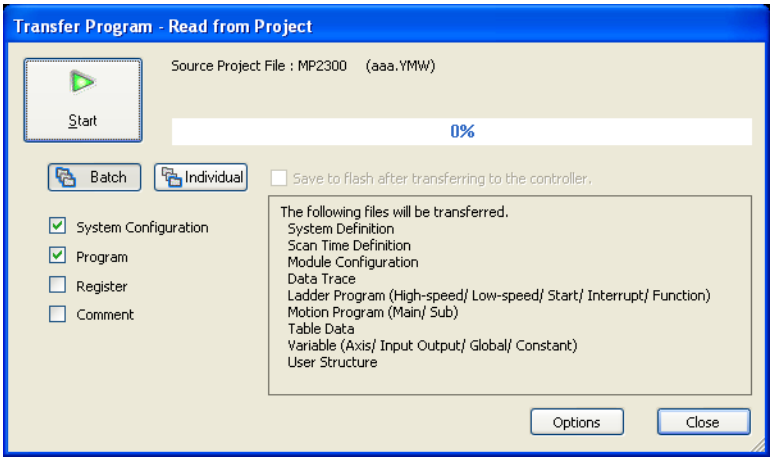
   The **Read from Project** Dialog Box will appear.

2. Select a project file from which a data is to be read and then click the **Open** Button.



   The **Transfer Program - Read from Project** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.

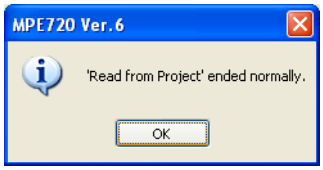


   When selecting the **Batch** or **Individual** Button, the types of data to be transferred (***System Configuration***, ***Program***, ***Register***, and ***Comment***) can be selected.
   When selecting the **Individual** Button, the particular data to be transferred can also be designated.

   - For details on the data of the ***System Configuration***, ***Program***, ***Register***, and ***Comment*** that is transferred, refer to *1.11.1 Overview of Data Transfers*.

   After clicking **Start**, the data will begin writing into the project file.

When writing is completed, the following message will appear. Click **OK**.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

1.11.8 Writing into the CF Card

The data can be written into the CF card. The operation of this function differs depending on whether a project file is open or not.

- When a project file is open

  The data in the open project file that needs to be saved in a CF card is transferred to the CF card.

- When the connection is made without an open project file

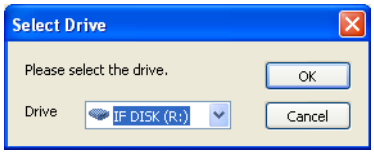
  The data in the currently open project file that needs to be saved in a CF card is transferred to the CF card mounted on the Machine Controller (MP2200 CPU-02). The transferred data will be written into the Machine Controller, as well.

Use the following procedure to save data in the CF card.

1. Select ***Online*** - ***Transfer*** from the main menu, and click the **Write into CF Card** Button in the **Transfer** Dialog Box.

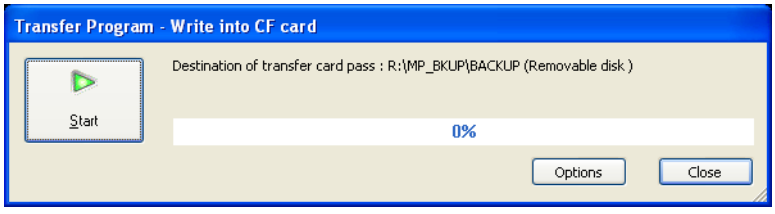
   The **Select Drive** Dialog Box will appear.

2. Select a drive to be used, and then click **OK**.

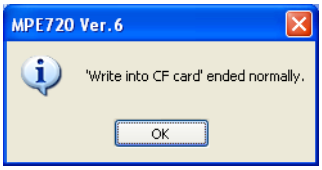


   The **Transfer Program - Write into CF Card** Dialog Box will appear.

3. Click the **Start** Button.



   Writing to the CF card will begin.
   When the writing is complete, the following message will appear. Click **OK** to end the transfer operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

1.11.9 Reading from CF Card

The data can be read from the CF card.
The operation of this function differs depending on whether a project file is open or not.

- When a project file is open

  Data will be transferred from the CF card to the open project file. When offline, a connection is made to the Machine Controller (MP2200 CPU-02) before starting transfer.

- When the connection is made without an open project file

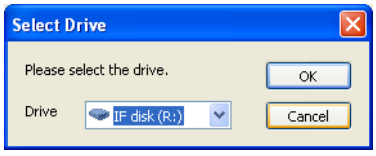
  Data will be transferred from the CF card to the Machine Controller (MP2200 CPU-02).

The procedure is as follows :

1. Select ***Online*** - ***Transfer*** from the main menu, and click the **Read from CF Card** Button in the **Transfer** Dialog Box.

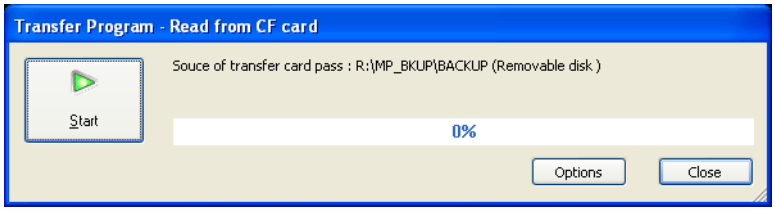
The **Select Drive** Dialog Box will appear.

2. Select a drive to be used, and then click the **OK** Button.

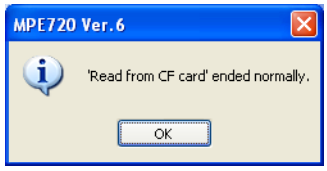


The **Transfer Program - Read from CF Card** Dialog Box will appear.

3. Click the **Start** Button.



Reading from the CF card will begin.
When the reading is complete, the following message will appear. Click **OK** to end the transfer operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

1.11.10 Comparison with the Machine Controller

This function differs, as described below, depending on whether a project file on the computer is open (when offline) and whether a Machine Controller is connected (when online).

- Offline
  After a connection is made to the Machine Controller, the data in the currently open project file and the data in the Machine Controller RAM are compared and the results are output to the Transfer Subwindow.
- Online
  When the project file for the data comparison is specified (or a new file is created), the data in the specified project file and the data in the Machine Controller RAM are compared and the results are output to the Transfer Subwindow.

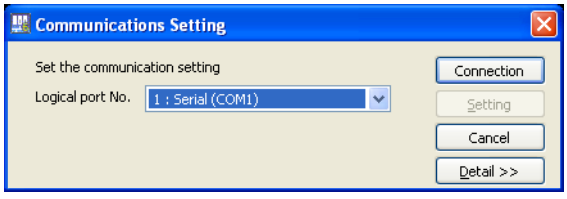
These methods are described in detail below.

(1) Offline

1. Select ***Online - Transfer*** from the main menu, and click the **Compare with Controller** Button in the **Transfer** Dialog Box.

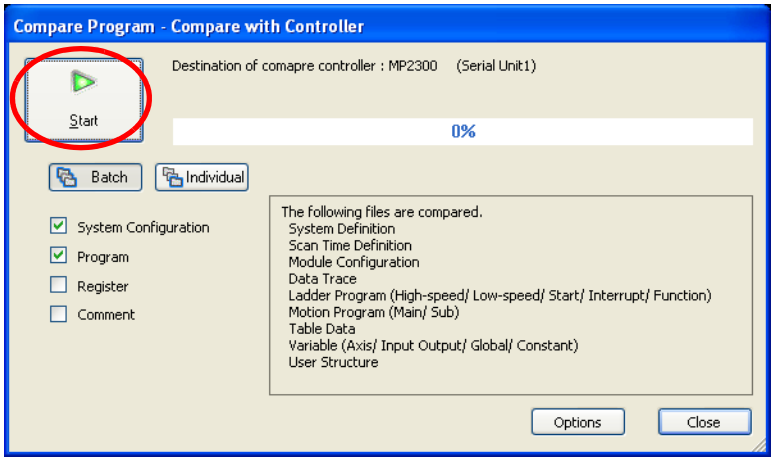
The **Communications Setting** Dialog Box will appear.

2. Select the port to be used for the transfer, and click the **Connection** Button.



The **Compare Program - Compare with Controller** Dialog Box will appear.

3. Select *Batch* or *Individual*, and then click the **Start** Button.

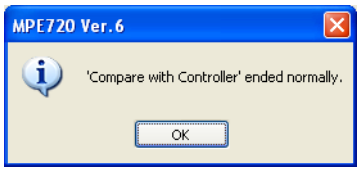


When selecting the **Batch** or **Individual** Button, the types of data to be compared (***System Configuration***, ***Program***, ***Register***, and ***Comment***) can be selected.
When selecting the **Individual** Button, the particular data to be compared can also be designated.

- For details on the data of the *System Configuration*, *Program*, *Register,* and *Comment* that is compared, refer to *1.11.1 Overview of Data Transfers*.

After clicking **Start**, the data will begin comparison.

When the comparison has been completed, the following message will be displayed. Click **OK** to end the compare operation.



No Difference Found



Differences Found

- After the comparison is completed, the data comparison log and result can be confirmed in the Transfer Sub-window.

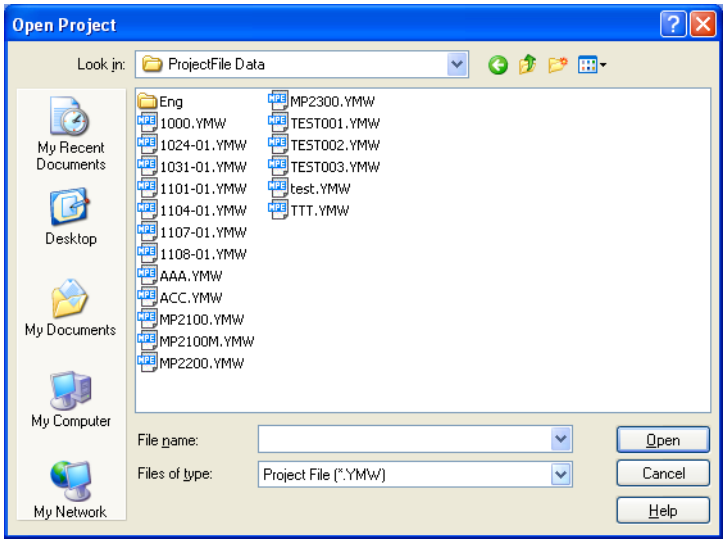
(2) Online

1. Select ***Online - Transfer*** from the main menu, and click the **Compare with Controller** Button in the **Transfer** Dialog Box.

The **Open Project** Dialog Box will appear.

2. Select the project file to be compared with the Machine Controller Data, and click the **Open** Button.

- When a connection is made to the Machine Controller after the project file has been opened, the file name of the open project file will be displayed in the *File name* Field as the default.



The **Compare Program - Compare with Controller** Dialog Box will appear.
The subsequent operations are the same as from step 3 onwards in *1.11.10 (1) Offline*.

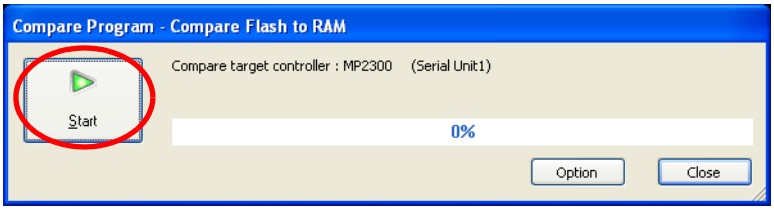
1.11.11 Comparing Flash Memory and RAM

This function compares the data in the Machine Controller RAM with the data in the flash memory, and outputs the results to the Transfer Subwindow. The function is valid only while connected online to the Machine Controller.
The procedure is as follows :

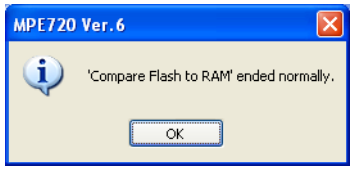
1. Select ***Online - Transfer*** from the main menu, and click the **Compare Flash to RAM** Button in the **Transfer** Dialog Box.

   The **Compare Program - Compare Flash to RAM** Dialog Box will appear.

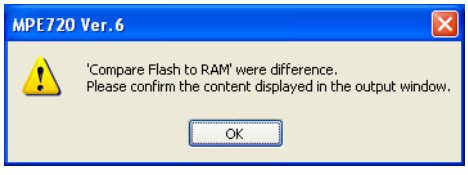
2. Click the **Start** Button.



The comparison between the data in flash memory and the data in RAM will begin.
When the comparison has been completed, one of the following messages will be displayed. Click **OK** to end the compare operation.



No Differences Found



Differences Found

- After the comparison is complete, the data comparison log and results can be confirmed in the Transfer Sub-window.

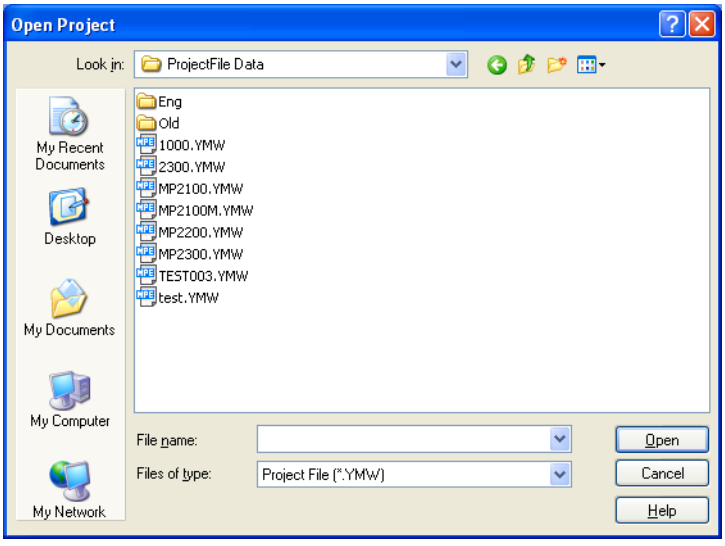
1.11.12 Comparing Project Files

This function compares the data in an open project file with the data in another project file, and outputs the results to the Transfer Subwindow. The function is valid only when not connected to the Machine Controller (i.e., when offline). The procedures is as follows :

1. Select ***Online - Transfer*** from the main menu, and click the **Compare with Project File** Button in the **Transfer** Dialog Box.

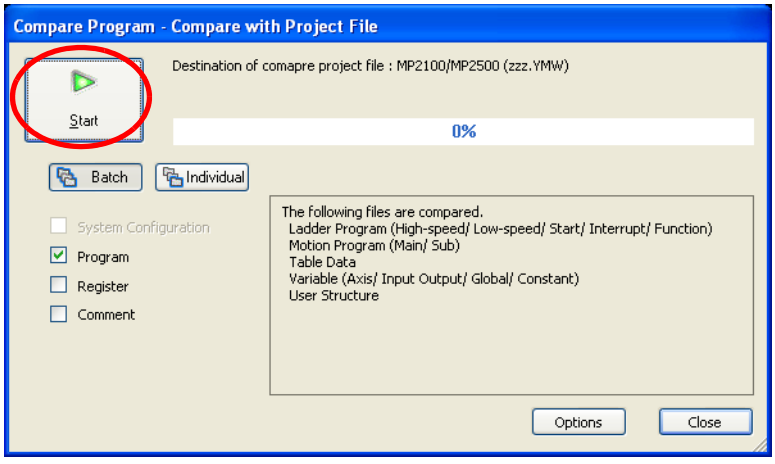
   The **Open Project** Dialog Box will appear.

2. Select the project file to be compared and click the **Open** Button.



   The **Compare Program - Compare with Project File** Dialog Box will appear.

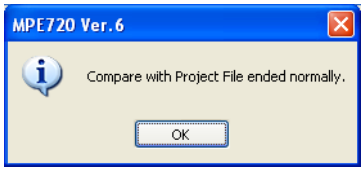
3. Select *Batch* or *Individual*, and then click the **Start** Button.



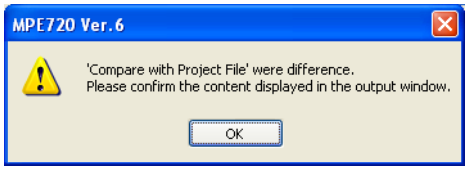
   When selecting *Batch*, select the types of data to be compared from among *System Configuration*, *Program*, *Register,* and *Comment*.
   When *Individual* is selected, not only can *System Configuration*, *Program*, *Register,* or *Comment* be specified, but also the particular data to be compared.

   - For details on the data of the *System Configuration*, *Program*, *Register,* and *Comment* that is compared, refer to *1.11.1 Overview of Data Transfers*.

The comparison with the project file will begin.
When the comparison has been completed, the following message will be displayed. Click **OK** to end the compare operation.



No Difference Found



Differences Found

- After the comparison is completed, the data comparison log and result can be confirmed in the Transfer Sub-window.

1.11.13 Comparing with CF Card Data

The data in the CF card will be compared with the data in a Machine Controller or a project file.
The operation differs depending on whether a project file on the computer is open (when offline) and whether a Machine Controller is connected (when online).

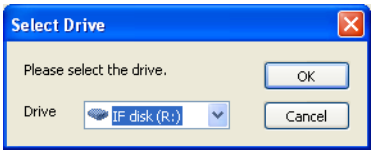
- When a project file is open
  The data in the open project file and the data in the CF card are compared, and the results are output to the Transfer Subwindow.
- When the Machine Controller (MP2200 CPU-02) is connected
  The data in the Machine Controller (MP2200 CPU-02) RAM and the data in the CF card are compared and the results are output to the Transfer Subwindow.

Use the following procedure to compare data.

1. Select ***Online*** - ***Transfer*** from the main menu, and click the **Compare with CF Card** Button in the Transfer Dialog Box.

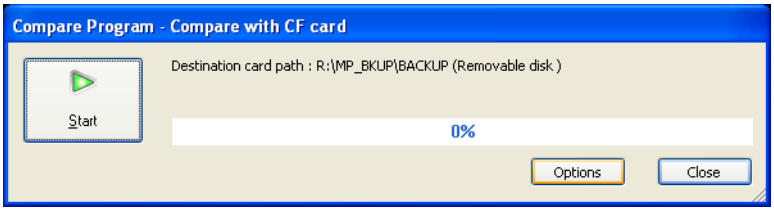
   The **Select Drive** Dialog Box will appear.

2. Select a drive, and then click **OK**.

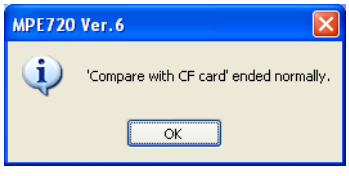


   The **Compare Program - Compare with CF Card** Dialog Box will appear.

3. Click the **Start** Button.



   Comparison will begin.
   When the comparison is complete, the following message will appear. Click **OK** to end the comparison operation.



   - After the comparison is complete, the comparison data log and results can be confirmed in the Transfer Subwindow.

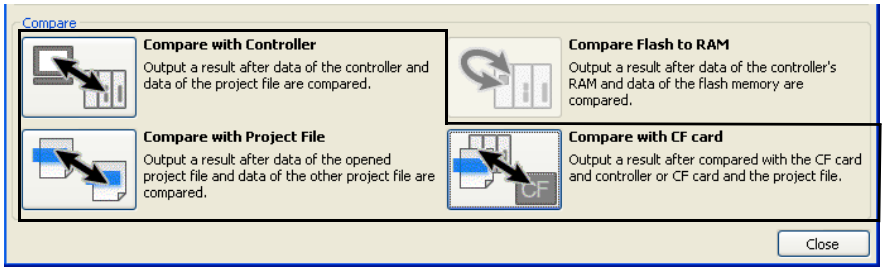
1.11.14 Detailed Comparison of Programs and Registers

Data in the programs saved to two memories can be compared in detail. Differences between the two sets of data are output to the Transfer Subwindow. With the Compare Flash to RAM function, the detailed comparison of programs is not possible.

- You can go to the corresponding program by double-clicking the output comparison result.
- The detailed comparison for programs is applicable only for ladder programs, motion programs, and registers.

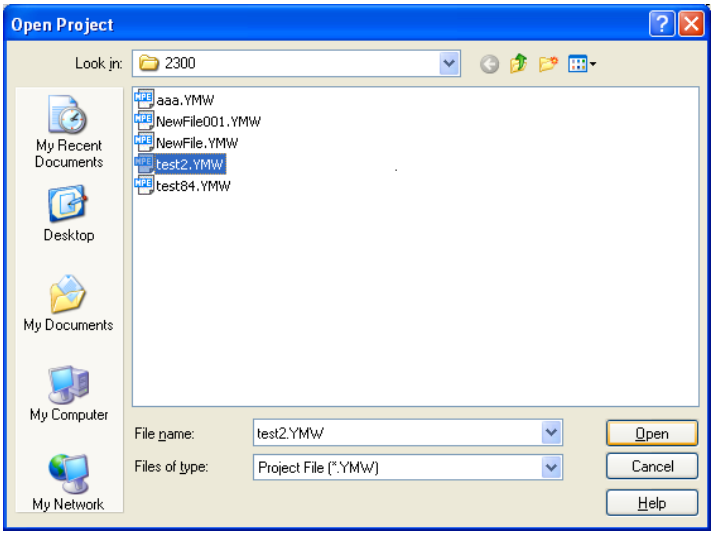
Use the following procedure to compare programs.

1. Select ***Online*** - ***Transfer*** from the main menu, and select a program to be compared in the **Transfer** Dialog Box.


Compare
Compare with Controller
Output a result after data of the controller and data of the project file are compared.
Compare Flash to RAM
Output a result after data of the controller's RAM and data of the flash memory are compared.
Compare with Project File
Output a result after data of the opened project file and data of the other project file are compared.
Compare with CF card
Output a result after compared with the CF card and controller or CF card and the project file.
Close

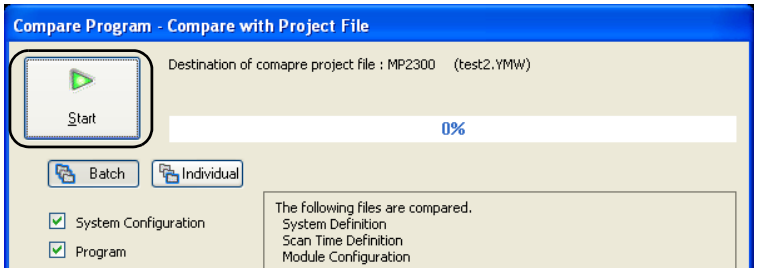
The **Open Project** Dialog Box will appear.

2. Select a data of project file, CF card, or Machine Controller to be compared, and then click the **Open** Button. This explanation will use the selection of ***Compare with Project File*** as an example.



The **Compare Program - Compare with Project File** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.



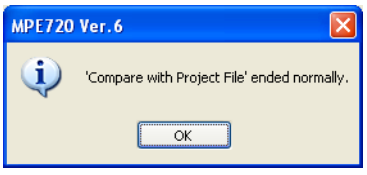
When selecting the **Batch** or **Individual** Button, the types of data to be compared (***System Configuration***, ***Program***, ***Register***, and ***Comment***) can be selected.

When selecting the **Individual** Button, the particular data to be compared can also be designated.

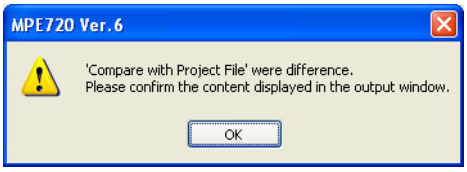
- For details on the data of the ***System Configuration***, ***Program***, ***Register***, and ***Comment*** that is transferred, refer to *1.11.1 Overview of Data Transfers*.

After clicking **Start**, the data will begin comparison.

When the comparison is complete, the following message will appear. Click **OK** to end the comparison operation.



No difference Found



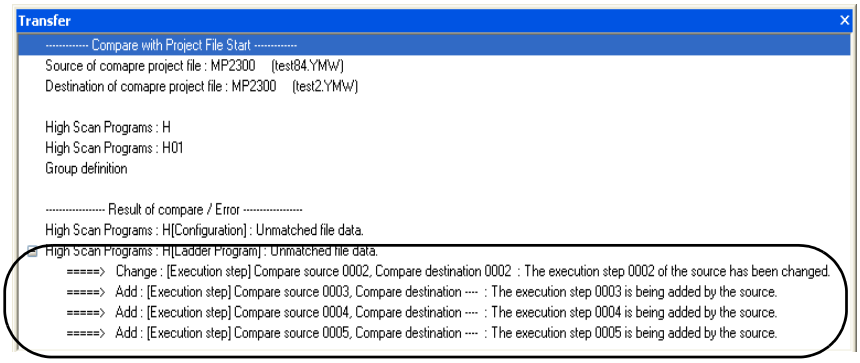
Differences Found

- After the comparison is complete, the data comparison log and results can be confirmed in the Transfer Subwindow.

(1) Jump Function from Transfer (Comparison Result) Subwindow

If unmatched data is found during comparison of program data, the unmatched data will be displayed in the Transfer Subwindow as follows. Double-click the unmatched data and you can go to the execution step or line where the unmatched data is found.

However, if unmatched data is found during comparison of CP ladder programs, the corresponding CP ladder program will open. If unmatched data is found during comparison with motion programs, you will go to the motion program line where the unmatched data is found.


Transfer
---------- Compare with Project File Start ----------
Source of comapre project file : MP2300 (test84.YMW)
Destination of comapre project file : MP2300 (test2.YMW)
High Scan Programs : H
High Scan Programs : H01
Group definition
---------- Result of compare / Error ----------
High Scan Programs : H[Configuration] : Unmatched file data.
High Scan Programs : H[Ladder Program] : Unmatched file data.
=====> Change : [Execution step] Compare source 0002, Compare destination 0002 : The execution step 0002 of the source has been changed.
=====> Add : [Execution step] Compare source 0003, Compare destination ---- : The execution step 0003 is being added by the source.
=====> Add : [Execution step] Compare source 0004, Compare destination ---- : The execution step 0004 is being added by the source.
=====> Add : [Execution step] Compare source 0005, Compare destination ---- : The execution step 0005 is being added by the source.

- Multiple differences were found though only one element in the program was modified
  This contradiction may appear in the results because ladder programs are compared on the base of execution codes (executable data after compilation) and one instruction is converted into multiple execution codes (instruction numbers). This will not cause any problems in the operation.
- Differences were found though the same data were compared.
  (a) This contradiction may appear due to differences between two types of compilations (normal compilation and version 5 compatible compilation). For a version 5 compatible compiler, the information on the version 5 compatible compilation is written on 0 to 4 steps of the program. However, for a normal compiler, such information is not given.

  (b) When comparing programs in which conditional instructions* are used, this contradiction may appear due to differences between two types of compilations (normal compilation and version 5 compatible compilation): the work registers used by MPE720 version 6 are optimized. To obtain perfectly matched results, execute compilation in the same compile mode.

  * Indicate the instructions displayed in the Ladder Subwindow. Refer to *Machine Controller MP900/MP2000 series New Ladder Editor User's Manual* (manual number: SIE-C887-13.1) for details.

1.12 Security

1.12.1 Security for User

For details, refer to *1.8.4 Security: User Registration*.

1.12.2 Security for Project Files

For details, refer to *1.8.5 Security: Project Password*.

1.12.3 Setting Passwords for Ladder Programs

Passwords can be set individually for each ladder program. A lock mark is displayed for each program for which a password has been set. To edit the program with a password, it is necessary to first enter the password.

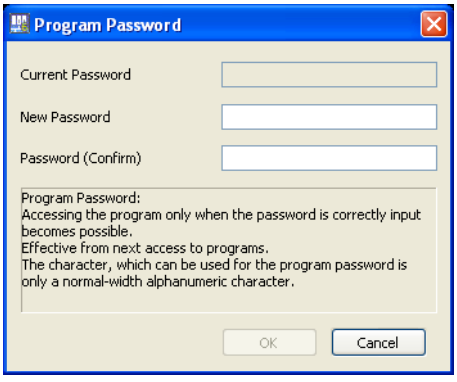
The purpose of the password is to control access for editing, and it does not affect the management of program files (copying, cutting, pasting, deleting, or enable/disable settings). (Refer to *3.4.3 Managing Ladder Program Files*.)

- Once a password has been set, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it, and that user will no longer be able to open the project file.

(1) Setting a Password

1. Right-click the program for which a password is to be set in the Ladder Subwindow, and select ***Set Password*** from the pop-up menu that will appear.

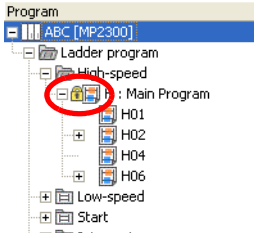
The **Program Password** Dialog Box will appear.


Program Password
Current Password
New Password
Password (Confirm)
Program Password:
Accessing the program only when the password is correctly input becomes possible.
Effective from next access to programs.
The character, which can be used for the program password is only a normal-width alphanumeric character.
OK
Cancel

2. Enter a password of one to eight characters in the *New Password* Field. Enter the same password again in the *Password (Confirm)* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of the text are entered in the *Password (Confirm)* Field.
- No distinction is made between uppercase and lowercase.

The **Program Password** Dialog Box will be closed, and a lock mark will be displayed next to the icon for the ladder program selected in step 1. If the applicable program is displayed in the Main Window, the program will be closed.



(2) Changing a Password

1. Right-click the program for which the password is to be changed in the Ladder Subwindow, and select ***Set Password*** from the pop-up menu that will be displayed.

The **Program Password** Dialog Box will be displayed.


Program Password
Current Password
New Password
Password (Confirm)
Program Password:
Accessing the program only when the password is correctly input becomes possible.
Effective from next access to programs.
The character, which can be used for the program password is only a normal-width alphanumeric character.
OK
Cancel

2. Enter the current password in the *Current Password* Field.
Enter a new password of 1 to 8 characters in the *New Password* Field. Enter the same password again in the *Password (Confirm)* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Password (Confirm)* Field.

The password will be changed, and the **Program Password** Dialog Box will be closed.

(3) Cancelling the Password

1. Right-click the program for which the password is to be cancelled in the Ladder Subwindow, and select ***Cancel Password*** from the pop-up menu that will be displayed.

The **Program Password** Dialog Box will be displayed.


Program Password
Program Password
Cancellation of program password:
The password set in the specified program is cancelled.
Effective from next access to programs.
The character, which can be used for the program password is only a normal-width alphanumeric character.
OK
Cancel

2. Enter the current password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

The lock mark will be removed from icon for the ladder program selected in step 1, and the **Program Password** Dialog Box will be closed.

(4) Opening a Ladder Program for which a Password Is Set

1. When an attempt is made to open a ladder program for which a password is set (i.e., a ladder program indicated by a lock at the icon), the Program Password Dialog Box is displayed.


Program Password
Program Password
Program Password:
The password is set in the specified program. It is necessary to input the password to open the program.
The character, which can be used for the program password is only a normal-width alphanumeric character.
OK
Cancel

2. Enter the current password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

The selected ladder program will be opened in the Main Window.

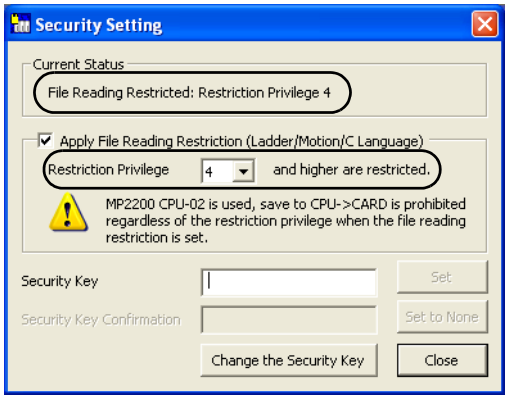
- When opening a CP ladder program or motion program, the password must be cancelled. If a password is required, a new password can be created after the operation is completed.

1.12.4 Online Security

(1) What is Online Security?

Online security is a function that prevents data in the Machine Controller from being read. The security key (password) and privilege level for the programs (both set in the **Security Setting** Dialog Box) enable the MPE720 version 6 to prevent unprivileged logged-on users from reading data from the Machine Controller and opening the programs.
This function helps protect the specified programs in the Machine Controller against undesired copying.
Online security can be set, cleared, or changed only when online (Machine Controller in project link connection or direct connection with the MPE720 version 6).
The logged-on user who is allowed to carry out operations related to security must have writing privilege level 7. The logged-on user with writing privilege level 0 to 6 cannot use the online security function. (The Security Setting command will be deactivated.)

- Refer to *1.9.1 Connecting to Machine Controllers* for online and offline connection to a Machine Controller.
- Refer to *1.8.4 Security: User Registration* for information on file privilege and user privilege.


Security Setting
Current Status
File Reading Restricted: Restriction Privilege 4
Apply File Reading Restriction (Ladder/Motion/C Language)
Restriction Privilege
4
and higher are restricted.
MP2200 CPU-02 is used, save to CPU->CARD is prohibited regardless of the restriction privilege when the file reading restriction is set.
Security Key
Security Key Confirmation
Set
Set to None
Change the Security Key
Close

Current Status

Displays the security setting status.

Apply File Reading Restriction

Select the check box to prevent the data from being read. Set the privilege level to prevent the ladder program, motion program and C-language program from being read in the ***Restriction Privilege*** Box.

- If the security key is set without selecting the ***Apply File Reading Restriction*** check box, only the security key will be set. The privilege (restriction privilege) to prevent the data from being read will not be set.

Restriction Privilege

Privilege level to restrict the files the user may read.

- Note that the user must have a privilege level higher than the set privilege to read files.

Security Key/Security Key Confirmation

The password required to set online security. Enter from 1 to 8 alphanumeric characters. The password is case sensitive.

Change the Security Key

Click this button to change the security key.

Set

Click this button to set the read-file restriction.

Set to None

Click this button to clear the current security setting.

Close

Click this button to close the **Security Setting** Dialog Box.

- When the ***Apply File Reading Restriction*** check box is selected while the CARD and SAVE DIP switches on Machine Controller MP2200 CPU-02 are set to ON, the function for saving to a CF card will be disabled. For details, refer to *Machine Controller MP2200 User's Manual* (manual no. SIEPC88070014).

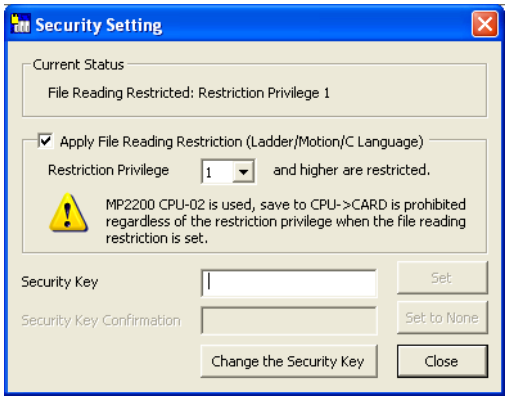
(2) How to Set, Clear, and Change Online Security

[a] Setting Online Security

To restrict users from reading data in the Machine Controller, use the following procedure when setting online security.

1. With the Machine Controller connected to the MPE720 version 6 (online), select ***Online*** - ***Security Setting*** from the main menu.

The **Security Setting** Dialog Box will appear.


Security Setting
Current Status
File Reading Restricted: Restriction Privilege 1
Apply File Reading Restriction (Ladder/Motion/C Language)
Restriction Privilege
1
and higher are restricted.
MP2200 CPU-02 is used, save to CPU->CARD is prohibited regardless of the restriction privilege when the file reading restriction is set.
Security Key
Security Key Confirmation
Set
Set to None
Change the Security Key
Close

2. Select the ***Apply File Reading Restriction*** check box, and then select a program privilege level from the ***Restriction Privilege*** combo-box list.

3. Enter a security key (password) in the ***Security Key*** Field, and re-enter it in the ***Security Key Confirmation*** Field. Then, click the **Set** Button.

The **Set** Button will be activated when one or more characters are entered in the ***Security Key Confirmation*** Field.
The file reading restriction and security key will be set, and the following message will be displayed asking for confirmation.


MPE720 Ver.6
Security setting has completed.
The security settings must be saved to flash memory to be enabled when starting from flash memory.
OK

4. Click **OK**.

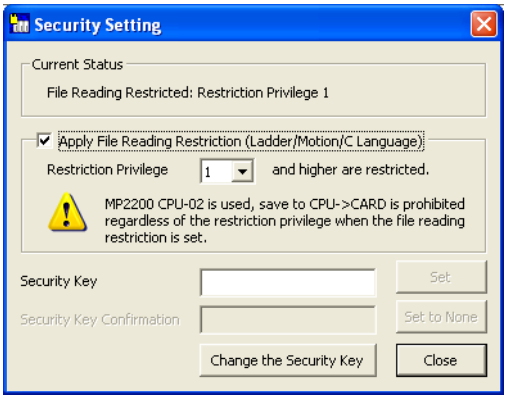
Click the **Close** Button in the upper-right to close the **Security Setting** Dialog Box.
If saving to flash memory is required, save the settings to the flash memory.

[b] Clearing Online Security Setting

The online security setting can be cleared by using the following procedure.

1. With the Machine Controller connected to the MPE720 version 6 (online), select ***Online*** - ***Security Setting*** from the main menu.

The **Security Setting** Dialog Box will appear.


Security Setting
Current Status
File Reading Restricted: Restriction Privilege 1
Apply File Reading Restriction (Ladder/Motion/C Language)
Restriction Privilege
1
and higher are restricted.
MP2200 CPU-02 is used, save to CPU->CARD is prohibited regardless of the restriction privilege when the file reading restriction is set.
Security Key
Security Key Confirmation
Set
Set to None
Change the Security Key
Close

2. Enter the correct security key (password) in the ***Security Key*** Field, and then click **Set to None**.

The following message will appear asking for confirmation.


MPE720 Ver.6
Security setting has been deleted.
The security settings must be saved to flash memory to be effective when starting from flash memory.
OK

3. Click **OK**.

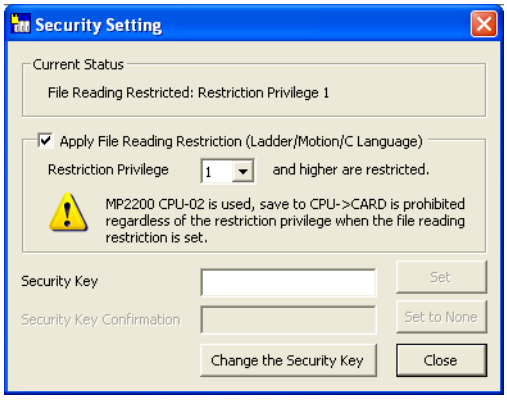
Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.
If saving to flash memory is required, save the change to the flash memory.

[c] Changing the Online Security Setting

The online security setting can be changed by using the following procedure.

1. With the Machine Controller Connected to the MPE720 version 6 (online), select ***Online*** - ***Security Setting*** from the main menu.

The **Security Setting** Dialog Box will appear.


Security Setting
Current Status
File Reading Restricted: Restriction Privilege 1
Apply File Reading Restriction (Ladder/Motion/C Language)
Restriction Privilege
1
and higher are restricted.
MP2200 CPU-02 is used, save to CPU->CARD is prohibited regardless of the restriction privilege when the file reading restriction is set.
Security Key
Set
Security Key Confirmation
Set to None
Change the Security Key
Close

2. Select or deselect the ***Apply File Reading Restriction*** check box, or change the level in the ***Restriction Privilege*** Field, as required.

3. Enter the correct security key (password) in the ***Security Key*** Field, and then click **Set**.

The following message will appear asking for confirmation.


MPE720 Ver.6
Security setting has completed.
The security settings must be saved to flash memory to be enabled when starting from flash memory.
OK

4. Click **OK**.

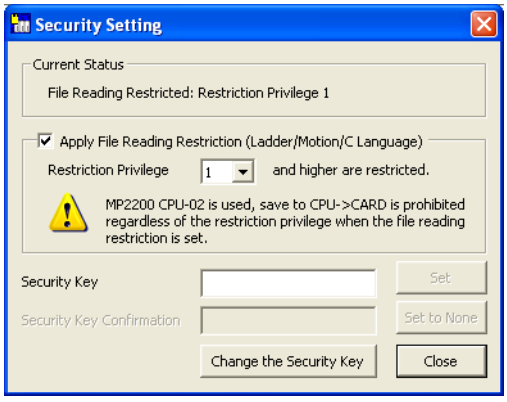
Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.
If saving to flash memory is required, save the change to the flash memory.

(3) Changing the Security Key (Password)

The security key for online security can be changed by using the following procedure.

1. With the Machine Controller connected to the MPE720 version 6 (online), select ***Online*** - ***Security Setting*** from the main menu.

The **Security Setting** Dialog Box will appear.


Security Setting
Current Status
File Reading Restricted: Restriction Privilege 1
Apply File Reading Restriction (Ladder/Motion/C Language)
Restriction Privilege
1
and higher are restricted.
MP2200 CPU-02 is used, save to CPU->CARD is prohibited regardless of the restriction privilege when the file reading restriction is set.
Security Key
Set
Security Key Confirmation
Set to None
Change the Security Key
Close

2. Click the **Change the Security Key** Button.

The ***Security Key Change*** Dialog Box will appear.



3. Enter the currently valid security key (password) in the ***Current Security Key*** Field and a new security key in the ***New Security Key*** Field. Re-enter the new security key in the ***New Security Key Confirmation*** Field. Then click **OK**.

The following message will appear asking for confirmation.


MPE720 Ver.6
Security setting has completed.
The security settings must be saved to flash memory to be enabled when starting from flash memory.
OK

4. Click **OK**.

Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.
If saving to flash memory is required, save the change to the flash memory.

Chapter 2

Configuration

This chapter provides an overview of module configuration definitions and motion parameter functions.

2.1 Module Configuration ----------2-2

2.2 Motion Parameters ----------2-4

2.2.1 Fixed Parameters ---------- 2-4
2.2.2 Setting Parameters ---------- 2-4
2.2.3 Monitoring Parameters ---------- 2-4
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2.2.5 Exporting/Importing Motion Parameters ---------- 2-6

2.1 Module Configuration

The Module Configuration Window is used to define the Machine Controller main module (CPU Module) and Option Modules.
When a project file is created, the module configuration must be set and saved. When the module is connected to a Machine Controller (project link connection and direct connection), change the module configulation if necessary and save it.
For details of module configuration definitions, refer to the MPE720 version 5 user's manual *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05).

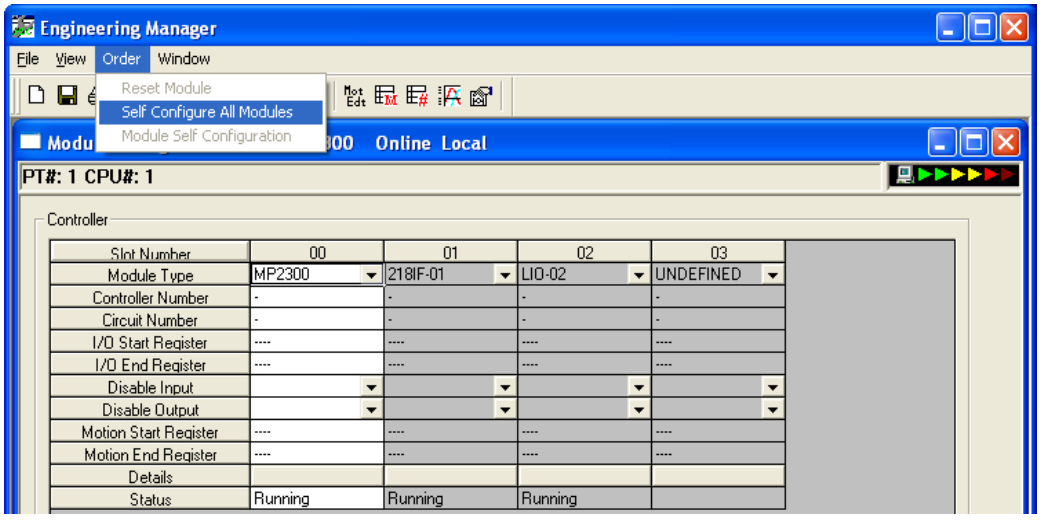
Set and save the module configuration of a Machine Controller with the following procedure.

1. Select ***Setup - Module Configuration Definitions*** from the Launcher.

   The Engineering Manager will be started.

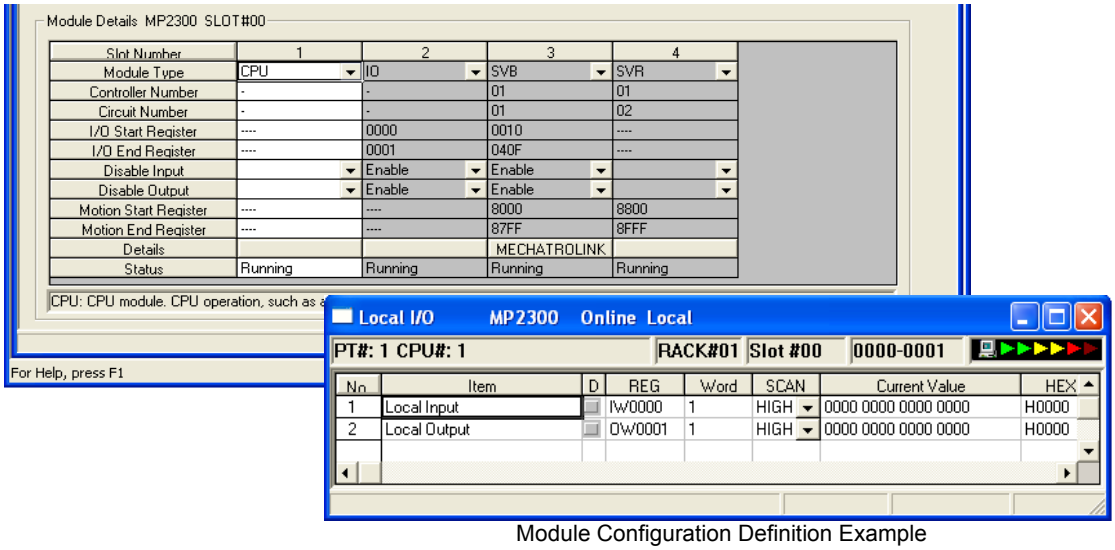
2. When online, select ***Order - Self Configure All Modules*** from the main menu.

   The data for all electrical devices connected to the Machine Controller will be written to the Machine Controller.



- When offline, Self-configuration cannot be executed. Make the settings manually for each Module.

3. Double-click Module detail fields as required to display Configuration Data Area and change the settings.



Module Configuration Definition Example

- For details on Configuration, refer to the relevant Machine Controller or Option Module operation manual.

4. Select ***File - Save & FLASH Save*** from the main menu.

The Module Configuration will be saved in the Machine Controller flash memory and RAM.

- When offline, execute the save operation by selecting ***File - Save***.

2.2 Motion Parameters

Motion parameters include fixed parameters, setting parameters, monitoring parameters, and SERVOPACK parameters. With MPE720 version 6, the variables, comments, and structures that are assigned to each motion parameter can be exported to a CSV file, or imported from the CSV file to the MPE720 version 6.

2.2.1 Fixed Parameters

Fixed parameters are used to define the specifications of the motor and machine to be used.
For details on fixed parameters, refer to *4.2.1 List of Fixed Parameters* of *Machine Controller MP2200/MP2300 User's Manual Motion Module* (manual number: SIEP C880700 16).

2.2.2 Setting Parameters

Each axis of a servo controller is operated by the setting parameters for the application.
For details on setting parameters, refer to *4.2.2 List of Setting Parameters* of *Machine Controller MP2200/MP2300 User's Manual Motion Modules* (manual number: SIEP C880700 16).

2.2.3 Monitoring Parameters

Current positions (current values) of moving axes are saved in the monitoring parameters.
For details on monitoring parameters, refer to *4.2.3 List of Monitoring Parameters* of *Machine Controller MP2200/2300 User's Manual Motion Modules* (manual number: SIEP C880700 16).

2.2.4 SERVOPACK Parameters

A SERVOPACK is operated according to the values set as SERVOPACK parameters.
For details on SERVOPACK parameters, refer to the relevant SERVOPACK manual.

(1) Value (Data) Display

The values (data) of a SERVOPACK that is connected to a Machine Controller are saved in the SERVOPACK parameters. Two types of values are saved in the SERVOPACK parameters: **Current Value** and **Input Data**

Current Value: Current value (data) of the connected SERVOPACK

Input Data: Values stored in a Machine Controller as a backup data

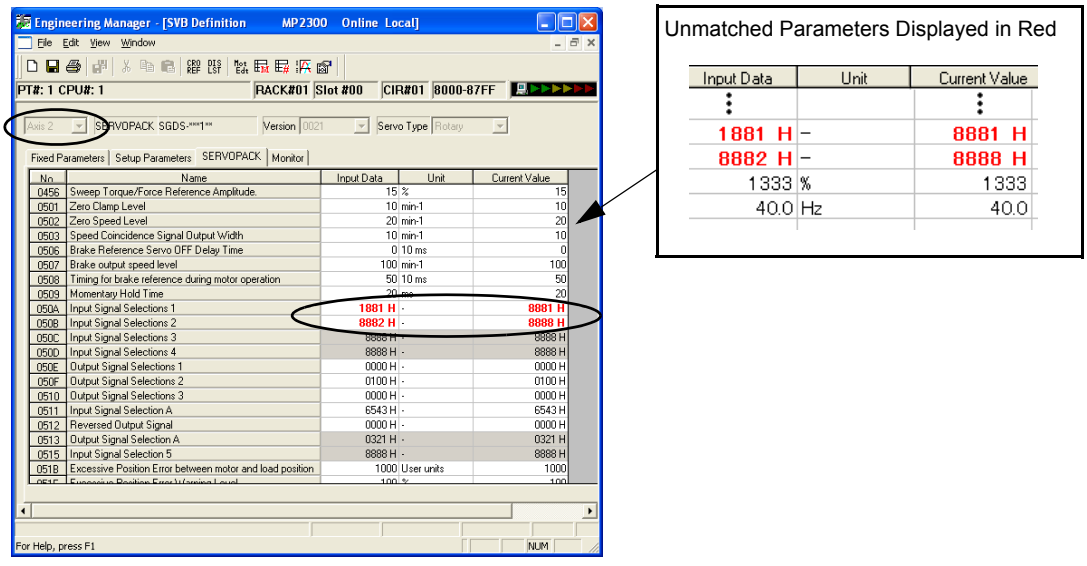
■ SERVOPACK Parameter Unmatched Data Display Function

When MPE720 version 6 is operated using a SERVOPACK, the Current Values may differ from the Input Values.
If SERVOPACK parameters are set with a software other than MPE version 6, such as SigmaWin+ and digital operator, the Input Values may be adjusted according to the specifications of the software that is used for setting.
If a difference is produced, the following message will be displayed in the SERVOPACK parameter setting window of Engineering Manager, and the parameters for which Current Values are different from the Input Values are displayed in red bold characters as shown below.

Alarm Message


Engineering Builder
The current value does not match the setting value.
There is a possibility to adjust the parameter of the SERVOPACK as "SigmaWin+" or a digital operator.
There is a possibility to malfunction when the SERVOPACK has adjusted because the setting value is written in the SERVOPACK when you "Save".
Please reflect the current value in the setting value according to the following procedure when the SERVOPACK has adjusted.
[procedure]
1. "Edit" menu
2. Select the "Servopack current value -> Setting value".
OK

SERVOPACK Parameter Setting Window


Engineering Manager - [SVB Definition MP2300 Online Local]
File Edit View Window
PT#: 1 CPU#: 1
RACK#01 Slot #00 CIR#01 8000-87FF
Axis 2
SERVOPACK SGDS-***1**
Version 0021
Servo Type Rotary
Fixed Parameters | Setup Parameters | SERVOPACK | Monitor
No. Name Input Data Unit Current Value
0456 Sweep Torque/Force Reference Amplitude. 15 % 15
0501 Zero Clamp Level 10 min-1 10
0502 Zero Speed Level 20 min-1 20
0503 Speed Coincidence Signal Output Width 10 min-1 10
0506 Brake Reference Servo OFF Delay Time 0 10 ms 0
0507 Brake output speed level 100 min-1 100
0508 Timing for brake reference during motor operation 50 10 ms 50
0509 Momentary Hold Time 20 ms 20
050A Input Signal Selections 1 1881 H - 8881 H
050B Input Signal Selections 2 8882 H - 8888 H
050C Input Signal Selections 3 8888 H - 8888 H
050D Input Signal Selections 4 8888 H - 8888 H
050E Output Signal Selections 1 0000 H - 0000 H
050F Output Signal Selections 2 0100 H - 0100 H
0510 Output Signal Selections 3 0000 H - 0000 H
0511 Input Signal Selection A 6543 H - 6543 H
0512 Reversed Output Signal 0000 H - 0000 H
0513 Output Signal Selection A 0321 H - 0321 H
0515 Input Signal Selection 5 8888 H - 8888 H
0518 Excessive Position Error between motor and load position 1000 User units 1000
For Help, press F1
NUM
Unmatched Parameters Displayed in Red
Input Data Unit Current Value
1881 H - 8881 H
8882 H - 8888 H
1333 % 1333
40.0 Hz 40.0

Display of alarm message and unmatched values can be used to prevent incorrect parameters from being written into a SERVOPACK.

Select ***Edit - SERVOPACK Current Value → Input Data*** from the main menu of the Engineering Manager to set the current value as the set value.

2.2.5 Exporting/Importing Motion Parameters

Motion parameter data can be exported from MPE720 version 6 to a CSV file, or imported from the CSV file to MPE720 version 6.

Export means saving data to a CSV file. The CSV file data can be easily edited using Microsoft Excel (hereinafter, referred to as Excel).

Import means loading the CSV file data to the MPE720 version 6.

- *Import* is enabled for all models of the Machine Controller.
- A file with CTF or YST extension cannot be edited.

The parameters that are applicable for import and export functions are fixed parameters, setting parameters, and SERVOPACK parameters of SVB-01, SVA-01, PO-01, and SVR Modules.

The following table shows the parameters of each module that are applicable for import and export function.

Module	Fixed Parameters	Setting Parameters	SERVOPACK Parameters
SVB-01	Applicable	Applicable	Applicable
SVA-01	Applicable	Applicable	Not applicable
PO-01	Applicable	Applicable	Not applicable
SVR	Applicable	Applicable	Not applicable

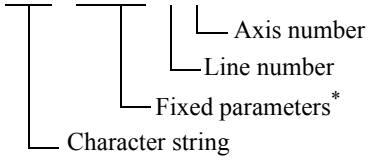
(1) CSV File

The specified name is set for each CSV file according to the motion parameter type, regardless of module type such as SVB-01, SVA-01, PO-01, and SVR, and a line number XX and axis number yy are added to the name.

A character string can be added in the beginning of each CSV file name as required.

Example: CSV file name with a character string MPE, for fixed parameters

CSV file name: MPE_FixPrm_xxyy.csv



* Fixed parameter = FixPrm, Setting parameter = SetPrm, SERVOPACK parameter = SrvPrm

A CSV file data consists of an array with array elements separated by commas.

When a motion parameter is exported to a CSV file, "No. (parameter number)" is converted to A, "Name" to B, "Input Data" to C, and "Units" to D. The REG (register number) column will not be exported (See the example on the next page.)

The following table shows the details of the structure of the CSV file data.

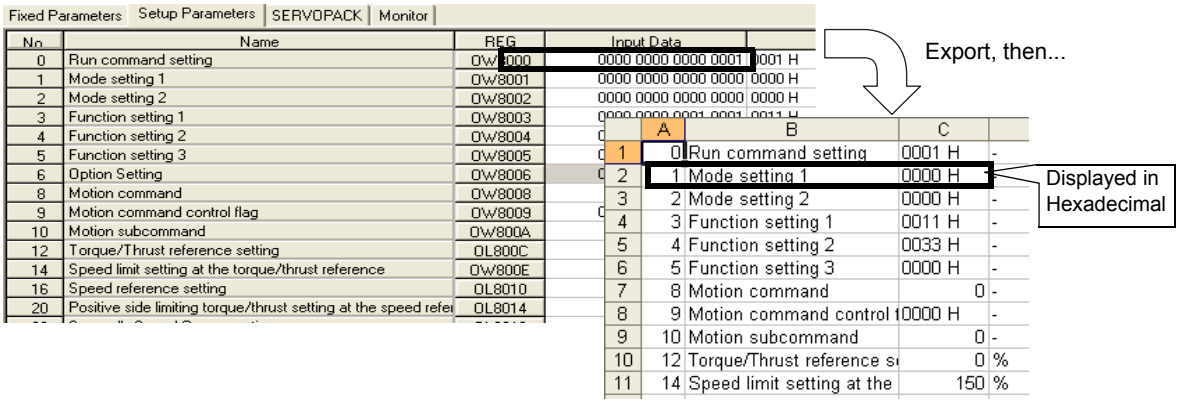
	A (No.)	B (Parameter name)	C (Input (set) data)	D (Units)
Export	Outputs the parameter number in the window.	Outputs the parameter name in the window.	Outputs the input data in the window.	Outputs the units in the window.
Import	Will not be read.	Will not be read.	The data of the parameter in the CSV file will be read and written to the corresponding parameter.	Will not be read

Motion parameters are classified into three types: *BIT* type, *Combo* type, and *Others*. The CSV file data format differs depending on these parameter types.

The display examples when the above types of parameters are exported to CSV files are shown below.

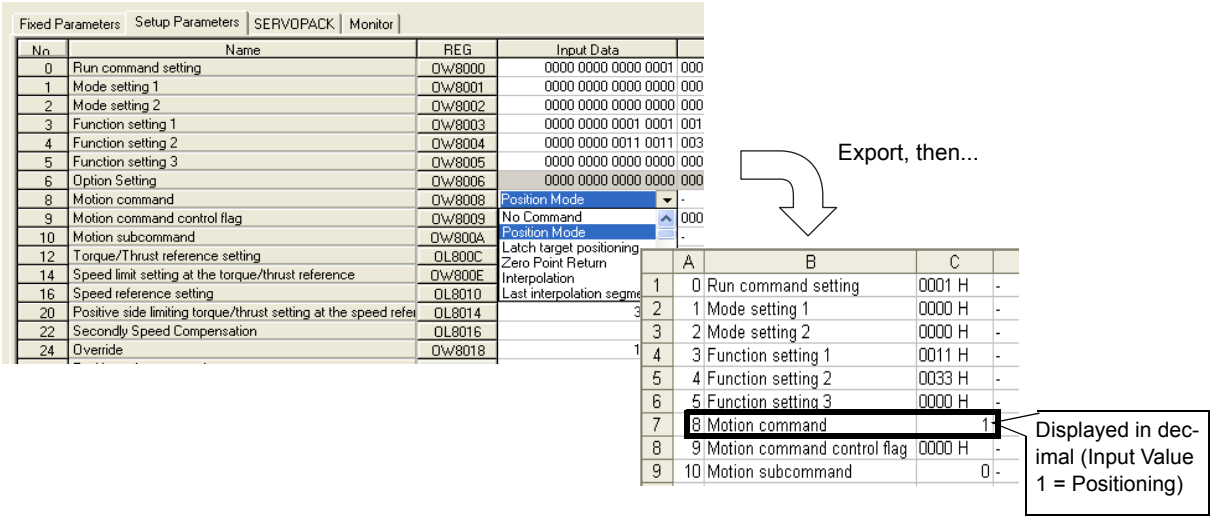
■ Parameters Set in Bits (BIT Type)

Save the parameter window displayed in the foreground of the **Engineering Manager** Window, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed in hexadecimal notation.



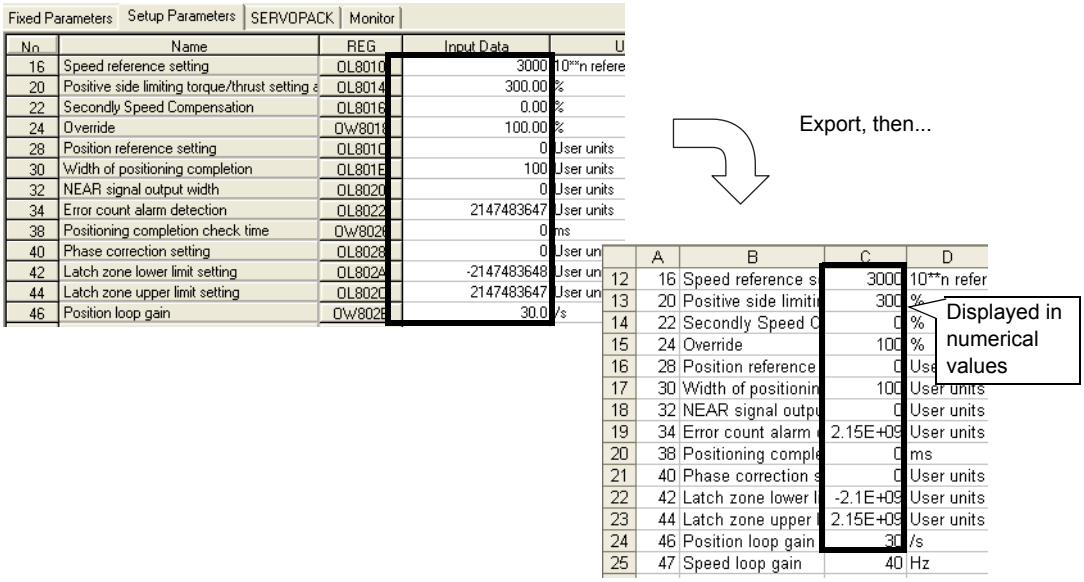
■ Parameters Selected from Combo Box (Combo Type)

Save the parameter window displayed in the foreground of the **Engineering Manager** Window, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed in decimal notation.



■ Parameters Set by Inputting Numerical Values (Others)

Save the parameter window displayed in the foreground of Engineering Manager, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed as they were displayed in the **Engineering Manager** Window (numerical values).


Fixed Parameters
Setup Parameters
SERVOPACK
Monitor
No
Name
REG
Input Data
16 Speed reference setting 3000 10**n refere
20 Positive side limiting torque/thrust setting 300.00 %
22 Secondly Speed Compensation 0.00 %
24 Override 100.00 %
28 Position reference setting 0 User units
30 Width of positioning completion 100 User units
32 NEAR signal output width 0 User units
34 Error count alarm detection 2147483647 User units
38 Positioning completion check time 0 ms
40 Phase correction setting 0 User un
42 Latch zone lower limit setting -2147483648 User un
44 Latch zone upper limit setting 2147483647 User un
46 Position loop gain 30.0 /s
Export, then...
A B C D
12 16 Speed reference s 3000 10**n refer
13 20 Positive side limiti 300 %
14 22 Secondly Speed C 0 %
15 24 Override 100 %
16 28 Position reference 0 Use
17 30 Width of positionin 100 User units
18 32 NEAR signal outpu 0 User units
19 34 Error count alarm 2.15E+09 User units
20 38 Positioning comple 0 ms
21 40 Phase correction s 0 User units
22 42 Latch zone lower l -2.1E+09 User units
23 44 Latch zone upper l 2.15E+09 User units
24 46 Position loop gain 30 /s
25 47 Speed loop gain 40 Hz
Displayed in numerical values

- When the number of digits of input data before export to a CSV file exceeds the space allowed, this value is displayed in exponent form such as “E+09”, when the CSV file is opened. This is because the display is limited by the cell width of the CSV file. (See the window shown above on the right.)
- Refer to *Machine Controller MP2200/2300 Motion Modules User’s Manual* (manual number: SIEP C880700 16) for details of Input data.

The procedures to export and import motion parameters are described on the following pages.

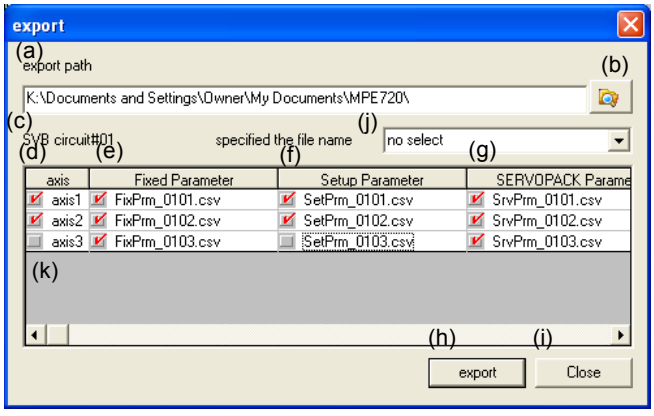
(1) Export

Select the CSV files created for each type of parameter, and then export the selected CSV files to MPE720 version 6.

1. Select ***File*** - ***Export*** from the main menu.

The **export** Dialog Box will appear.

2. Set the required items.



The setting items and methods are as follows.

(a) Export Path

Specify the path of the folder for saving the selected CSV file data. Either directly input the path or click the browse button (b) to select from the **Select Folder** Dialog Box.

When the dialog box is opened, either the previously set path or MyDocument\MPE720 is displayed.

(b) **Browse** Button

Click this button to display the **Select Folder** Dialog Box. Select a folder and the selected folder will be set as export path (a).

(c) Module Name

Displays the module name and line number of the motion parameter setting window displayed in the foreground of **Module Configuration Definition** Window.

Module Name

The module name for which a line number is assigned in the subslot, SVB01, SVA01, PO, or SVR, is displayed.

Line Number

Displays the line number defined in the Module Configuration Definition. (Line #xx: xx = 1 to 16)

* Refer to *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05) for details on subslot and line number.

(d) Axis

Displays the axis assigned for the module. The information given in the axis combo box in the motion parameter setting window of Engineering Manager is displayed.

(e) Fixed Parameter

Displays CSV file names "FixPrm_xxyy.csv" for fixed parameters of CSV file data. xx indicates a line number, and yy indicates an axis number.

(f) Setup Parameter

Displays CSV file names "SetPrm_xxyy.csv" for setting parameters of CSV file data. xx indicates a line number, and yy indicates an axis number.

(g) SERVOPACK Parameter

Displays CSV file names “SrvPrm_xxyy.csv” for SERVOPACK parameters of CSV file data.
xx indicates a line number, and yy indicates an axis number.

(h) **Export** Button

Click this button to export the files selected with check marks.

(i) **Close** Button

Click this button to close the dialog box. Export will not be executed.

(j) Specifying the File Name

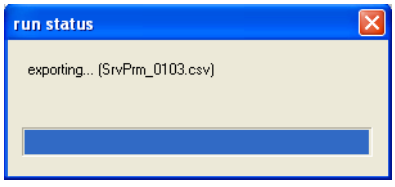
Add an unique character string at the beginning of the motion parameter file name to specify the file name.
Example: Fixed parameter file name when MPE is specified: MPE_FixPrm_xxyy.csv

(k) Check Box

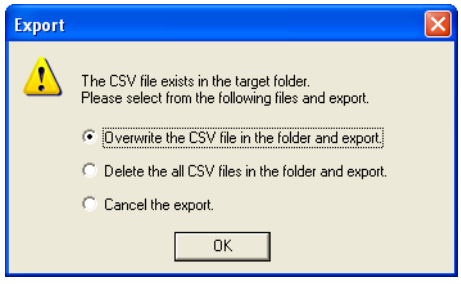
Click the box to select the file to be exported.

3. Click the **export** Button.

Exporting of the selected files will start and the progress indicator will display the percentage of the process that has been completed.



If a duplicate file name exists in the export destination folder, the following message will appear. Select one of the options shown in the following image, and then click **OK**.


Export
The CSV file exists in the target folder.
Please select from the following files and export.
Overwrite the CSV file in the folder and export.
Delete the all CSV files in the folder and export.
Cancel the export.
OK

Overwrite the CSV file in the folder and export:

The data at the export destination will be overwritten with the new file data.

Delete the all CSV files in the folder and export:

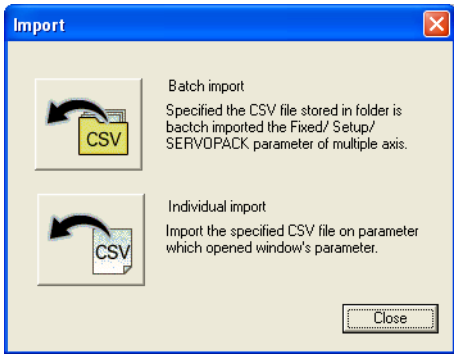
All the data at the export destination will be deleted and the new file data will be exported.

Cancel exporting:

The export operation will be cancelled and the dialog box will close.

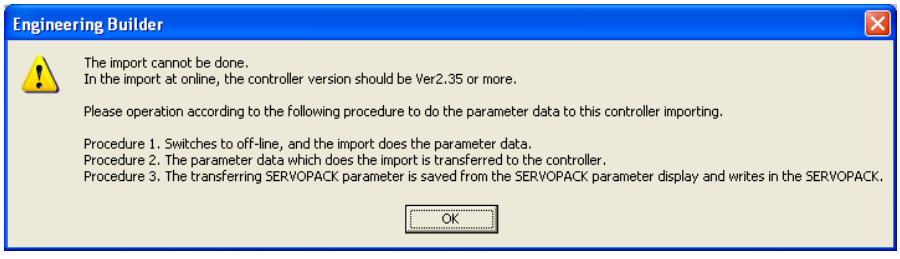
(2) Import

Multiple parameters can be imported at one time, or each CSV file can be imported individually.
On the main menu in the Engineering Manager, select ***File-Import***. The **Import** Dialog Box will appear. Select ***Batch import*** or ***Individual import***.


Import
Batch import
Specified the CSV file stored in folder is bactch imported the Fixed/ Setup/ SERVOPACK parameter of multiple axis.
CSV
Individual import
Import the specified CSV file on parameter which opened window's parameter.
CSV
Close

- Online Import Operation, Applicable Machine Controller Versions
  When online (connected to a Machine Controller), the import operation is disabled by some Machine Controller versions. The following Machine Controller versions are applicable for online import operation: Machine Controller with SVB built-in CPU version 2.35 or later, and Machine Controllers with option SVB modules version 1.13 or later. With a Machine Controller with SVB built-in CPU versions earlier than 2.35 or a Machine Controller with option SVB modules versions earlier than 1.13, the following error message will appear if an attempt is made to import files.

Example: When connected to Machine Controller with SVB built-in CPU


Engineering Builder
The import cannot be done.
In the import at online, the controller version should be Ver2.35 or more.
Please operation according to the following procedure to do the parameter data to this controller importing.
Procedure 1. Switches to off-line, and the import does the parameter data.
Procedure 2. The parameter data which does the import is transferred to the controller.
Procedure 3. The transferring SERVOPACK parameter is saved from the SERVOPACK parameter display and writes in the SERVOPACK.
OK

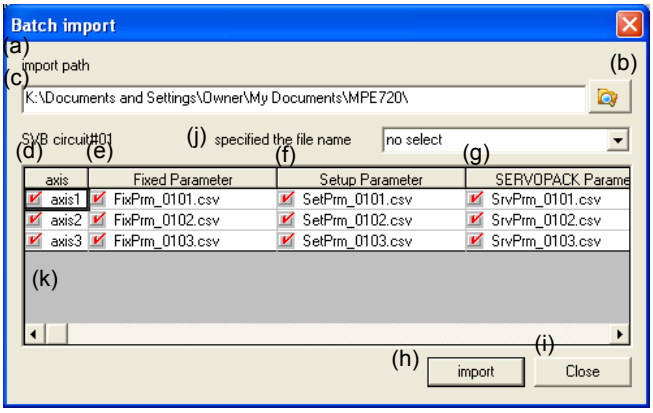
The following sections describe how to import CSV files individually or in a batch.

[a] Batch Import

1. Select ***File*** - ***Import*** on the main menu. Then in the **Import** box click the **Batch Import** (button).

The **Batch import** Dialog Box will appear.

2. Set the required items.



The setting items and methods are as follows:

(a) Import Path

Specify the path of the folder in which CSV files are to be saved. Either directly input the path or click the browse button (b) to select from the **Select Folder** Dialog Box.

When the dialog box is opened, either the previously set path or MyDocument\MPE720 is displayed.

(b) **Browse** Button

Click this button to display the **Select Folder** Dialog Box. Select a folder and the selected folder will be set for export path (a).

(c) Module Name

Displays the module name and line number of the motion parameter setting window displayed in the foreground of the **Module Configuration Definition** Window.

Module Name

The module name for which a line number is assigned in the subslot, SVB01, SVA01, PO, or SVR, is displayed.

Line Number

Displays the line number defined in the Module Configuration Definition. (Line #xx: xx = 1 to 16)

For details on subslot and line numbers, refer to *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05).

(d) Axis

Displays the axis assigned for the module. The information given in the axis combo box in the motion parameter setting window of Engineering Manager is displayed.

(e) Fixed Parameters

Displays CSV file names "FixPrm_xxyy.csv" for fixed parameters of CSV file data. xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(f) Setup Parameters

Displays CSV file names “SetPrm_xxyy.csv” for setting parameters of CSV file data. xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(g) SERVOPACK Parameters

Displays CSV file names “SrvPrm_xxyy.csv” for SERVOPACK parameters of CSV file data.
xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(h) **Import** Button

Click this button to import the files selected with check marks.

(i) **Close** Button

Click this button to close the dialog box. Import will not be executed.

(j) Specifying the File Name

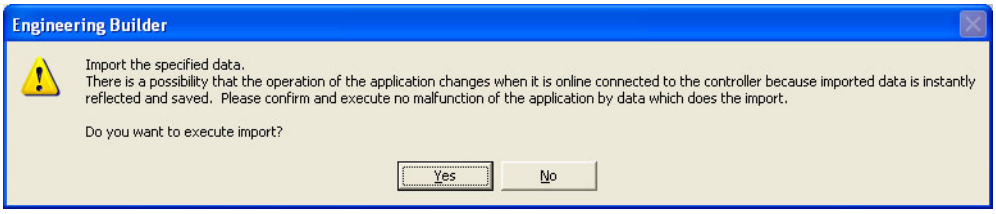
Add an unique character string at the beginning of the motion parameter file name to specify the file name.
Example: Fixed parameter file name when MPE is specified: MPE_FixPrm_xxyy.csv

(k) Check Box

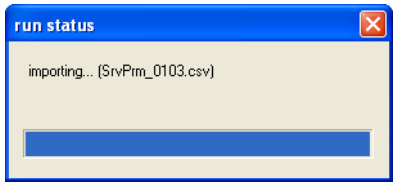
Click the box to select the file to be imported.

3. Click the **Import** Button.

The following message will appear asking for confirmation.

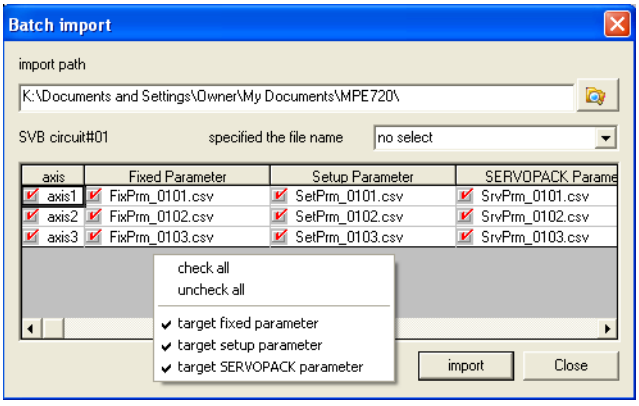

Engineering Builder
Import the specified data.
There is a possibility that the operation of the application changes when it is online connected to the controller because imported data is instantly reflected and saved. Please confirm and execute no malfunction of the application by data which does the import.
Do you want to execute import?
Yes
No

Click **Yes** to start a batch import. When the importing starts, the progress indicator will display the percentage of the process that has been completed.



- Limiting File Options for Import

Right-click the mouse in the **Batch import** Dialog Box to open the pop-up menu. Click to clear the check mark from the target fixed parameter, target setup parameter, and target SERVOPACK parameter. Then these three parameter types will be excluded from the files to be imported.
The import file options set by using the pop-up menu will be retained until the MPE720 version 6 is turned OFF and then ON again.

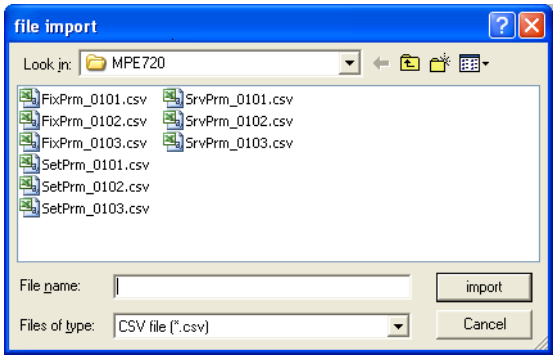


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[b] Individual Import

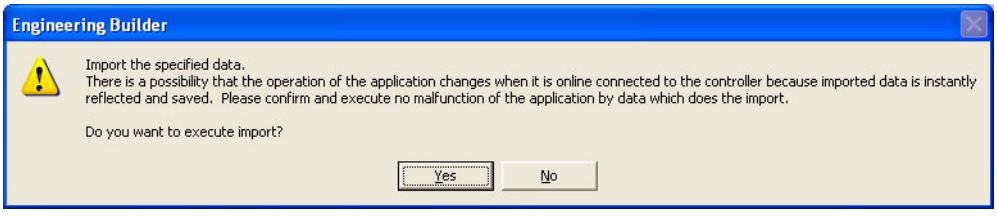
1. Select ***File*** - ***Import*** from the main menu and click the **Individual Import** Button in the **Import** Dialog Box.

The **file import** Dialog Box will appear. All the CSV files, including files whose names start with the specified character string, can be selected.

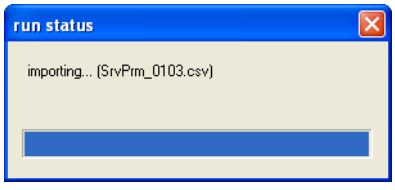


2. Select a CSV file to be imported, and then click **import**.

The following message will appear.


Engineering Builder
Import the specified data.
There is a possibility that the operation of the application changes when it is online connected to the controller because imported data is instantly reflected and saved. Please confirm and execute no malfunction of the application by data which does the import.
Do you want to execute import?
Yes
No

Click **Yes** to start importing the selected file. When importing starts, the progress indicator will display the percentage of the process that has been completed.



- The selected CSV file data will be imported to the parameter window displayed in the foreground of the currently opened window.

Chapter 3

Ladder Programming

This chapter provides an overview of ladder programming and describes basic operations.

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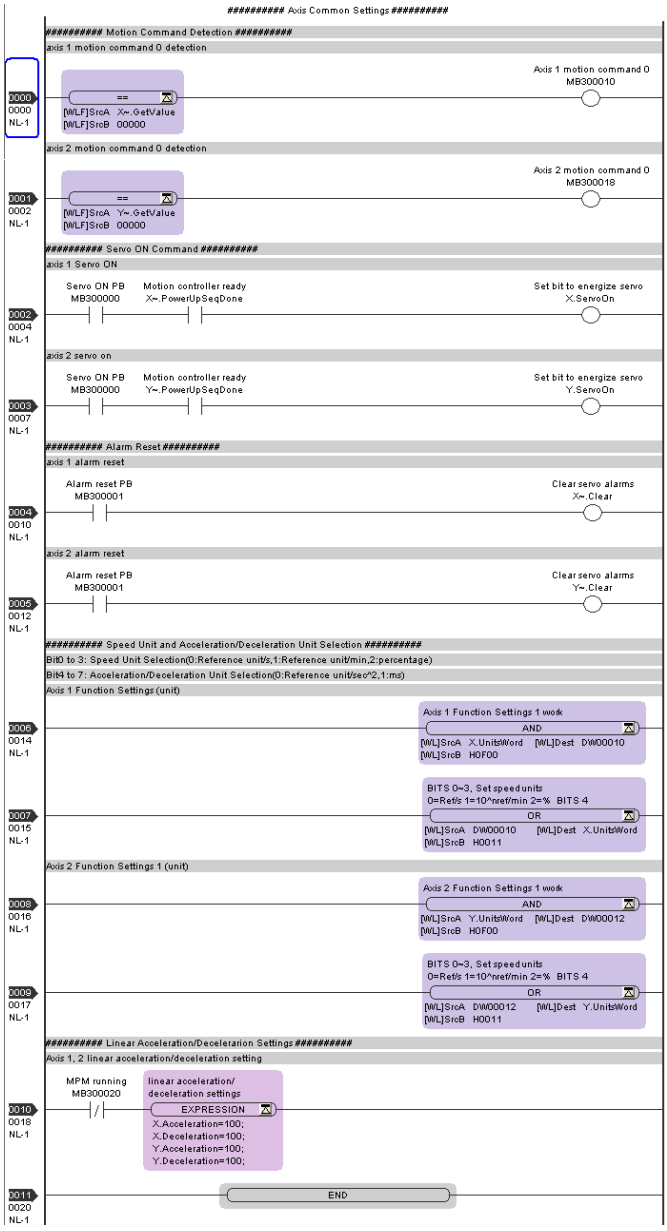
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3.1 Overview of Ladder Programming

3.1.1 What is Ladder Programming?

A ladder program is a control program for Machine Controllers created using ladder objects. Machine control is executed by combining multiple ladder programs, using high-speed and low-speed scan processing.
Creating and editing ladder programs in the MPE720 version 6 Ladder Program Edit Window is called ladder programming.
When a ladder program has been transferred to the Machine Controller CPU after a ladder program has been compiled in MPE720 version 6, it can be executed.

The following diagram shows an example of a ladder program.



- For details on displaying the Ladder Program Edit Window, refer to *3.2 Beginning Ladder Programming*.
- For details on editing ladder programs, refer to *3.3 Editing Ladder Programs*.
- For details on compiling ladder programs, refer to *3.3.17 Ladder Program Compiling and Compile Options*.
- For details on transferring Machine Controller programs, refer to *1.11 Transferring Data*.

3.1.2 Overview of Ladder Program Functions

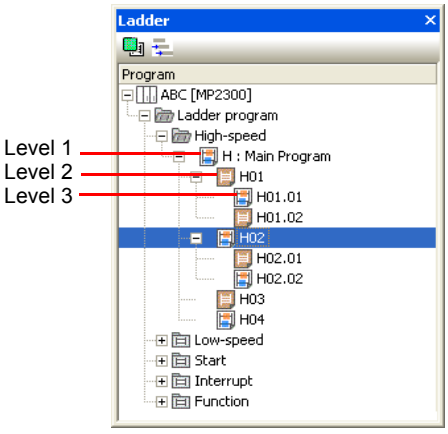
(1) Ladder Program Types and Priorities

The various types of ladder programs are shown below and are executed in order of priority.

- High-speed Scan Processing Programs (H Programs; Priority 3)
  These are operation control programs that are executed in each high-speed scan.
- Low-speed Scan Processing Programs (L Programs; Priority 4)
  These are operation control programs that are executed in each low-speed scan.
- Startup Processing Programs (A Programs; Priority 1)
  These programs are executed only once after the power is turned ON to the Machine Controller and perform the initial settings at startup.
- Interrupt Processing Programs (I Programs; Priority 2)
  These programs are launched when an interrupt signal is received, and are executed only once per interrupt.
- Processing Error Processing Programs (X00 Programs; X = A, I, H, L; Priority 2)
  These programs are started automatically by the system program when a processing error occurs in a program (i.e., when an error interrupt signal is received). Only one error program can be created under each A, I, H, and L program.

A folder is displayed for each program type in the Ladder Subwindow.

(2) Hierarchical Structure and Restrictions on Ladder Programs



A, I, H, and L program structures can contain up to three hierarchical levels, from level 1 to level 3.
The level 1 program is called the main program, and only one main program can be created for the A, I, H, and L programs.
Level 2 and level 3 programs can be referenced from higher-level programs using the SEE instruction.
The maximum total number of level 2 and 3 programs depends on the program type, as follows:

- A programs: 62
- I programs: 62
- H programs: 198
- L programs: 498

Fig. 3.1 Ladder Subwindow

- For details on operations and changing the display in the Ladder Subwindow, refer to *3.4.3 Managing Ladder Program Files*. Ordinary ladder programs are indicated by in the Ladder Subwindow, and CP ladder programs are indicated by .

(3) Functions and Motion Programs

Functions and motion programs are both programming elements that can be referenced for use from ladder programs. They can be referenced from ladder programs at any hierarchical level, from level 1 to level 3. The features of functions and motion programs are described below.

■ Functions

Functions are a programming element referenced from other ladder programs. They are created in the Function Folder in the Ladder Subwindow. They are also sometimes called user functions. Functions are created by setting the number of input registers, output registers, or address registers. In ladder programs, they can be called using FUNC instructions.

- For details on creating functions, refer to *3.3.15 Creating Functions*. For details on entering and defining functions in a ladder program, refer to *3.3.16 Calling Functions*.

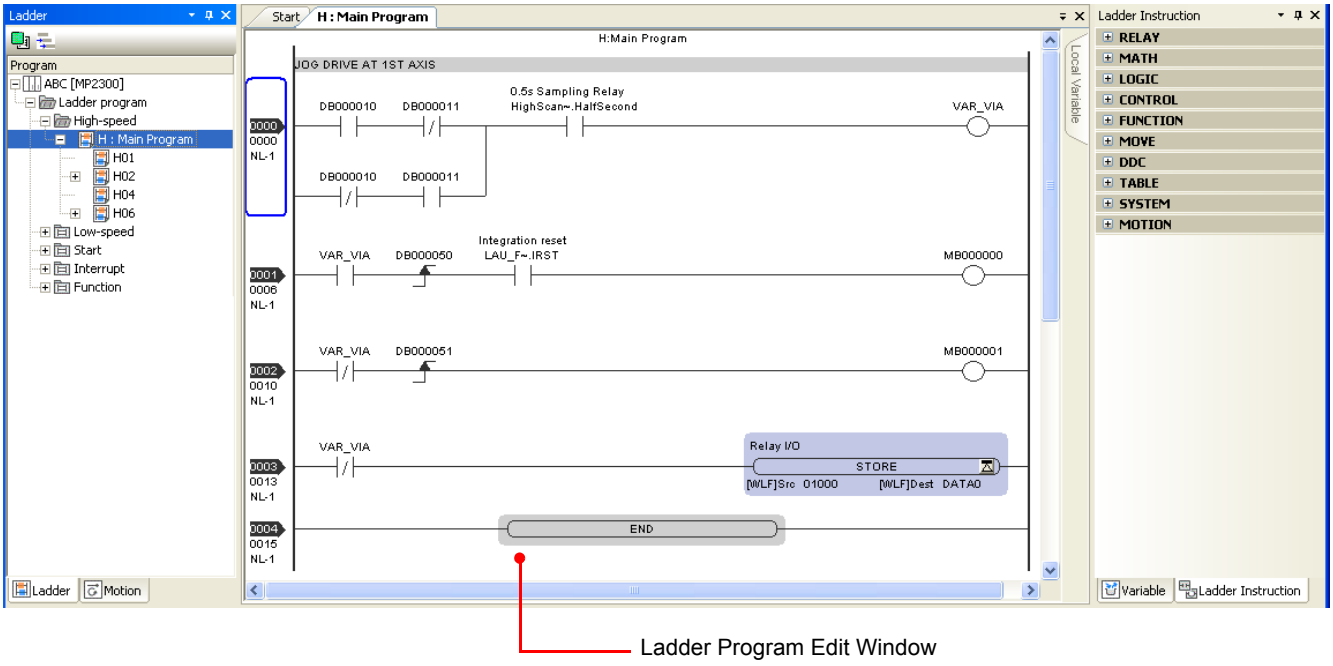
■ Motion Programs

A motion program is a program written in a textual language called motion language. In addition to main programs, it can create sub programs that is called from the main programs.

- For details on motion programs, refer to *Chapter 4 Motion Programming*.

3.2 Beginning Ladder Programming

Ladder programs can be edited by displaying the **Ladder Program Edit** Window in the Main Window.



The **Ladder Program Edit** Window is displayed to perform either of the following operations:

- Creating new ladder programs
- Opening ladder programs

Both of these operations are described below.

- For details on the **Ladder Program Edit** Window, refer to *3.3.1 Ladder Program Edit Window*.

3.2.1 Creating New Ladder Programs

1. With a project file open, right-click a program folder from *High-speed* to *Interrupt*, or a level 1 or 2 program in the Ladder Subwindow and select ***Create New Program*** from the pop-up menu that will be displayed.

The **Create New Program** Dialog Box will be displayed.

2. Set each item, and then click the **OK** Button.

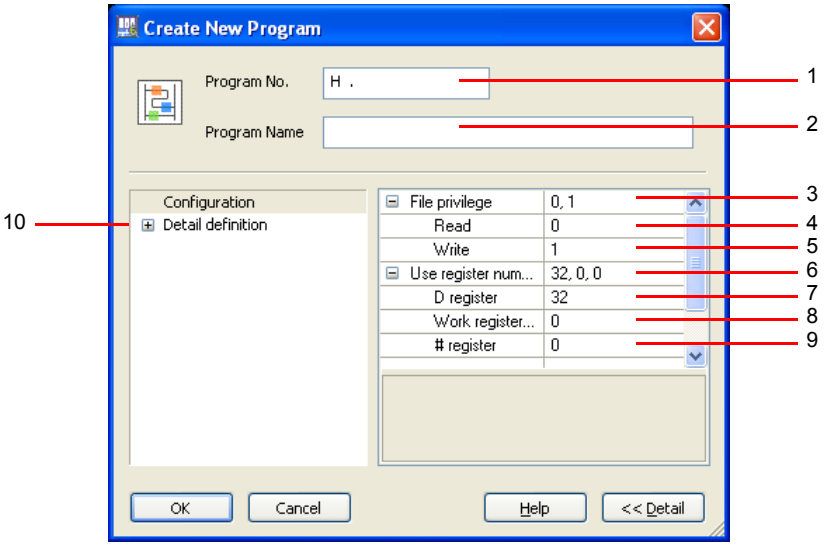


Fig. 3.2 Create New Program Dialog Box

The items to be set and the methods for setting them are described below.

1. Program Number

Enter the program number using alphanumeric characters beginning with the program type (A, I, H, or L). The following rules apply when assigning program numbers.

Level 1 programs (main programs): A, I, H, or L only. Numbers are not allowed.
Level 2 programs: Xnn (X = A, I, H, or L. n = 0 to 9)
Level 3 programs: Xnn.nn (X = A, I, H, or L. n = 0 to 9)

- Only one main program can be created within each of the A, I, H, and L programs.
- Only one X00 program (A, I, H, or L processing error processing program, X = A, I, H, or L) can be created within each of the A, I, H, and L programs.
- When the **Create New Program** Dialog Box is started from a folder or file in the Ladder Subwindow, the program numbers that can be created are displayed.

2. Program Name

Enter a program name using a maximum of 48 characters.

3. File Privileges

The reading privilege level (see *4. Read*) and writing privilege level (see *5. Write*) for the program are displayed here.

4. Read

Select a reading privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A reading privilege level cannot be set higher than the current user privilege level. (For example, if the current user level is 3, a level of 4 or higher cannot be set.)
- For details on user privilege levels and reading privilege levels, refer to ■*User Privilege Levels and Reading and Writing Privilege Levels*, below.

5. Write

Select a writing privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A writing privilege level cannot be set higher than the current user level.
- For details on user privilege levels and writing privilege levels, refer to *■User Privilege Levels and Reading and Writing Privilege Levels* below.

6. Use Register Number

The number of D registers, work registers, and # registers used by this program are displayed here.

7. D Register

Set the maximum number of D registers (between 0 and 16,384) to be used by this program. The number can be set either by directly entering it or by using the spin buttons.

8. Work Register

The number of D registers used as work registers by the system is displayed here. This number cannot be set.

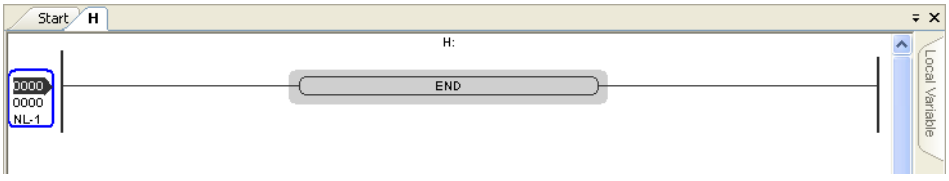
9. # Register

Set the maximum number of # registers (from 0 to 16,384) to be used by this program. The number can be set either by directly entering it or by using the spin buttons.

10. Detail Definition

This setting is not required when creating a new program. Refer to *3.4.3 (5) Ladder Program Properties*.

Make the above settings, and click the **OK** Button. The **Create New Program** Dialog Box will be closed, and the **Ladder Program Edit** Window will be displayed as shown below with only the program title (by default, the program number), the number 0000 rung, and the END instruction entered. A ladder program can now be created.



- For details on editing ladder programs and on the terminology, refer to *3.3 Editing Ladder Programs*.

■ User Privilege Levels and Reading and Writing Privilege Levels

Program reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit and save a program, the user must have a privilege level at least as high as the program's writing privilege level.

- For details on setting and checking user privilege levels, refer to *1.8.4 Security: User Registration*.

3.2.2 Creating Ladder Programs in the CP Form

A new ladder program can be created using CP ladder language by selecting *Use* of *Create new CP ladder* option in the **Environment Setting** Dialog Box. Ordinary ladder programs can be included in the same project file along with CP ladder programs.

- Ordinary ladder programs are indicated by , and CP ladder programs are indicated by in the Ladder Subwindow.
- When a ladder program is created in the CP form, use the Engineering Manager to save the program.

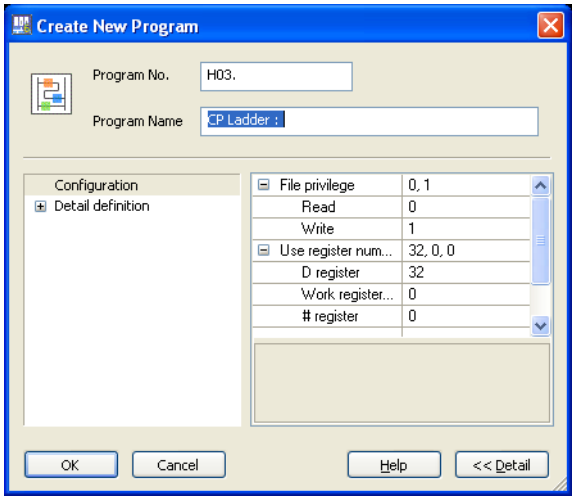
(1) Creating New Programs from the Ladder Subwindow

1. In the Ladder Subwindow, right-click a program folder or program from *High-speed* to *Interrupt*, and select ***Create new CP ladder*** from the pop-up menu that will be displayed.

- ***Create new CP ladder*** is displayed only when the *Create new CP ladder: use* Option is selected in the Environment Setting Dialog Box. For details, refer to *1.8.9 Ladder: General*.

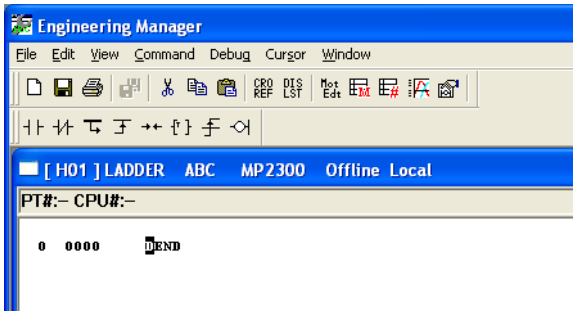
The **Create New Program** Dialog Box will be displayed.

2. Set each item and then click the **OK** Button.



- For details on the items to be set, refer to *3.2.1 Creating New Ladder Programs*.

The Engineering Manager will be started, and the Edit Window for CP ladder programs will be displayed.



(2) Creating New Programs from the Engineering Manager

After the Engineering Manager has been started, a new CP ladder program can be created.

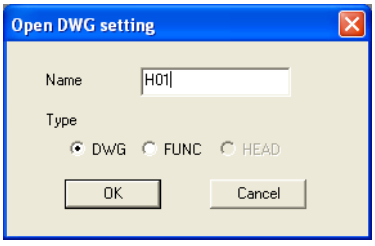
1. Select ***Utility - Engineering builder*** from the Launcher.

The Engineering Manager will be started.

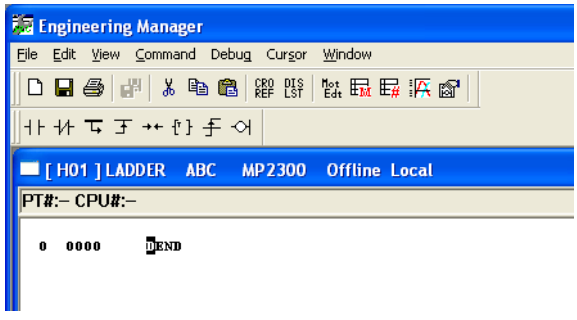
2. Select ***File - Open - Program - Open New Diagram*** from the Main Menu.

The **Open DWG setting** Dialog Box will be displayed.

3. Enter the name of the diagram, and then click the **OK** Button.



The Edit Window for CP ladder programs will be displayed.



3.2.3 Opening Ladder Programs

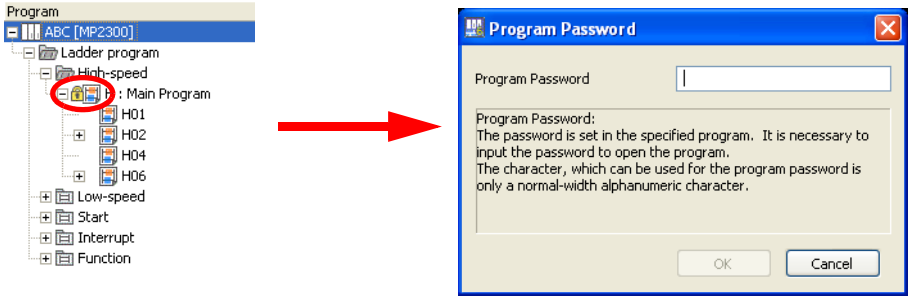
A ladder program can be opened by executing any of the following operations with the project file open.

- In the Ladder Subwindow, double-click the program to be opened.
- In the Ladder Subwindow, right-click the program to be opened, and then select ***Open*** from the pop-up menu that will be displayed.

The only programs that can be opened, however, are programs for which the reading privilege level is no higher than the current user privilege level. A selected program cannot be opened if the reading privilege level is higher than the user privilege level.

- For details on user, reading, and writing privilege levels, refer to *■User Privilege Levels and Reading/Writing Privilege Levels*.

If an attempt is made to open a ladder program for which a password is set (i.e., a ladder program indicated by a lock at the icon), the **Program Password** Dialog Box will be displayed.



When the dialog box is displayed, enter the password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

CP ladder programs can also be opened. For details, refer to *1.7.4 Opening an MPE720 Version 5 MAL File*.

■ User Privilege Levels and Reading/Writing Privilege Levels

Program reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit a program, the user must have a privilege level at least as high as the program's write privilege level.

- For details on setting and checking user privilege levels, refer to *1.8.4 Security: User Registration*.

3.2.4 Opening CP Ladder Programs

CP ladder programs can be opened from Engineering Manager.
A maximum of 16 CP ladder programs can be opened. CP ladder programs are opened in the same way as ladder programs described in *3.2.3 Opening Ladder Programs*.

3.2.5 Displaying and Editing MPE720 Version 6 Ladder Programs on MPE720 Version 5

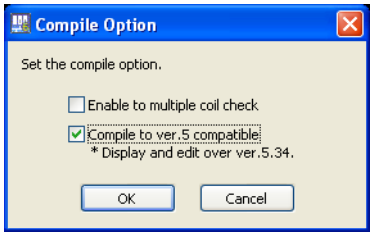
To display and edit the ladder programs that were created on MPE720 version 6 on MPE720 version 5, the ladder programs need to be compiled into MPE720 version 5 compatible programs.
The ladder programs can be compiled into MPE720 version 5 compatible programs by the following methods.

- MPE720 version 5 compatible programs mean that programs originally made with version 6 are compiled into a format that is compatible with MPE720 version 5.
- Refer to *3.3.17 Ladder Program Compiling and Compile Options* for details.

1. Select ***Compile*** - ***Compile Option*** from the Main Menu.

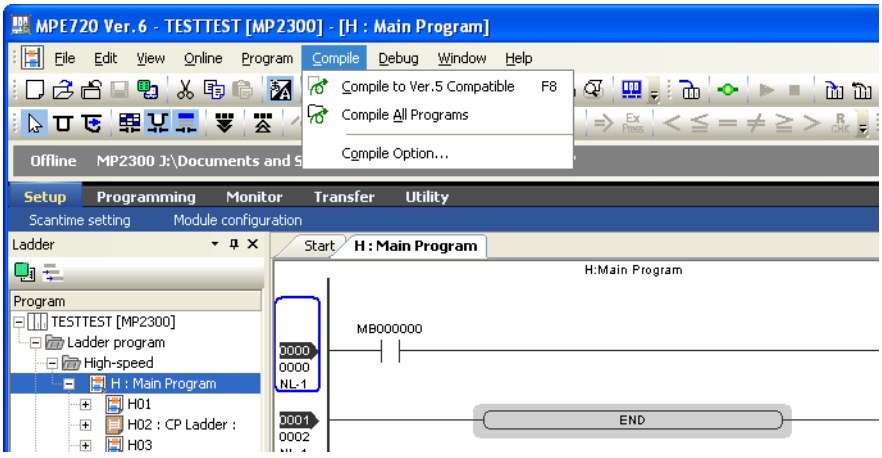
The **Compile Option** Dialog Box will open.

2. Select ***Compile to ver.5 compatible***, and then click **OK**.



3. Select ***Compile*** from the Main Menu again. The ***Compile to Ver.5 Compatible*** command will appear under Compile menu.

Click ***Compile to Ver.5 Compatible*** to start compilation.



- Selecting ***Compile*** - ***Compile All Programs*** from the Main Menu will compile all ladder programs at once.

4. Write the ladder program into the Machine Controller and save.

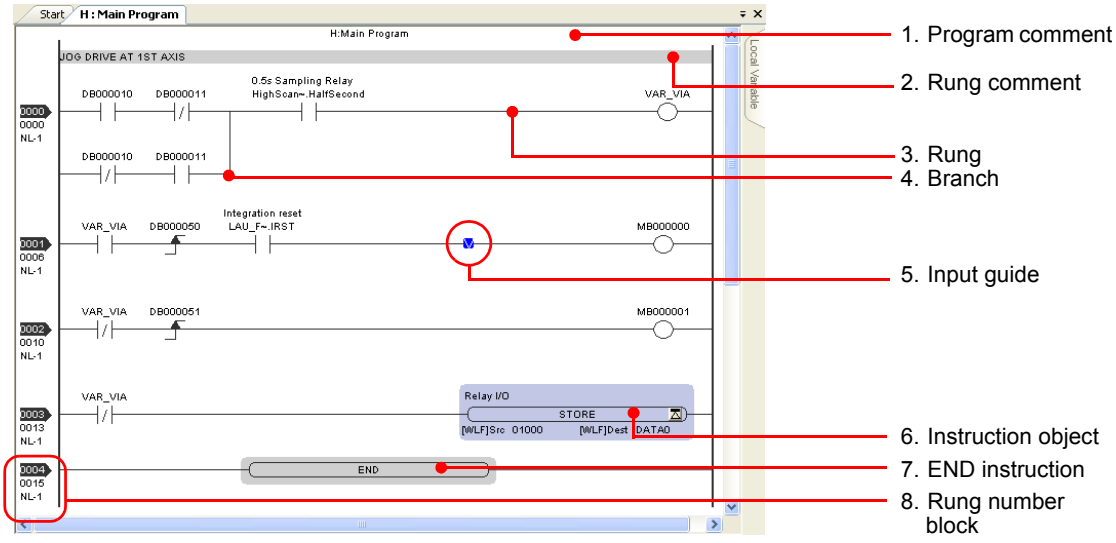
Start MPE720 version 5 and read the data of the ladder program from the Machine Controller.

3.3 Editing Ladder Programs

This section describes the operations in the Ladder Program Edit Window.

3.3.1 Ladder Program Edit Window

The overview and the components of the Ladder Program Edit Window are shown in the following illustration and described below.



1. Program Comments

A comment about the program. The program name is displayed as the program comment when the program is created.

- For details on editing program comments, refer to *3.3.5 Editing Program Comments*.

2.Rung Comments

A comment about the next rung or rung block. Multiple rung comments can be set for a single rung.

- For details on creating and editing rung comments, refer to *3.3.6 Inserting and Editing New Rung Comments*.

3. Rungs

A basic line for placing objects, such as instructions and branches.

- For details on inserting and editing rungs, refer to *3.3.7 Inserting and Editing New Rungs*.

4. Branches

Lines used for arranging instructions in parallel. Further branches can also be created from the original branches.

- For details on inserting and editing branches, refer to *3.3.8 Inserting Branches* and *3.3.9 Editing Branches*.

5. Input Guide

Displays the object entry position.

6. Instruction Objects

The instruction name, comment, variable name, and register address* are displayed for each instruction object. Different instruction types are distinguished by color.

* The register address can be displayed or hidden. The default is for the register address to be hidden (as in the above window). For details on displaying or hiding addresses, refer to *3.3.4 Changing Edit Window Displays*.

- For details on inserting and editing instructions, refer to *3.3.10 Inserting Instruction Objects* and *3.3.11 Editing Instruction Objects*.

7. END Instruction

Entered when a program is created and indicates the end of the program. Cannot be edited.

8. Rung Number Blocks

Displays Rung information. Rung information cannot be edited.

Line 1, rung number: The rung number is displayed.

Line 2, step number: The total number of steps up until that rung is displayed.

Line 3, nesting number: The nesting level is displayed.

Objects

All components used in creating ladder programs are called objects.

3.3.2 Main Functions Used in Editing Ladder Programs

The following toolbars and subwindows can be used when editing ladder programs.

- Ladder Editor Toolbar
- Ladder Instruction Toolbar
- Ladder Instruction Subwindow
- Variable Subwindow

(1) Ladder Editor Toolbar



The Ladder Editor Toolbar is used for editing ladder program objects.

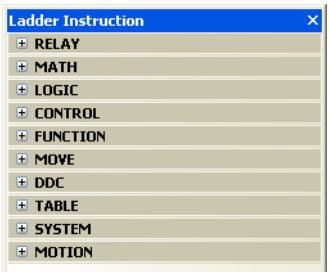
(2) Ladder Instruction Toolbar



The Ladder Instruction Toolbar is used for entering instruction objects into ladder programs. Instruction objects can be entered by simply clicking the icons.

- For details on entering instruction objects, refer to *3.3.10 Inserting Instruction Objects*.

(3) Ladder Instruction Subwindow



The Ladder Instruction Subwindow is used for entering instruction objects into ladder programs. Instructions can be entered by dragging and dropping them in edit subwindows.

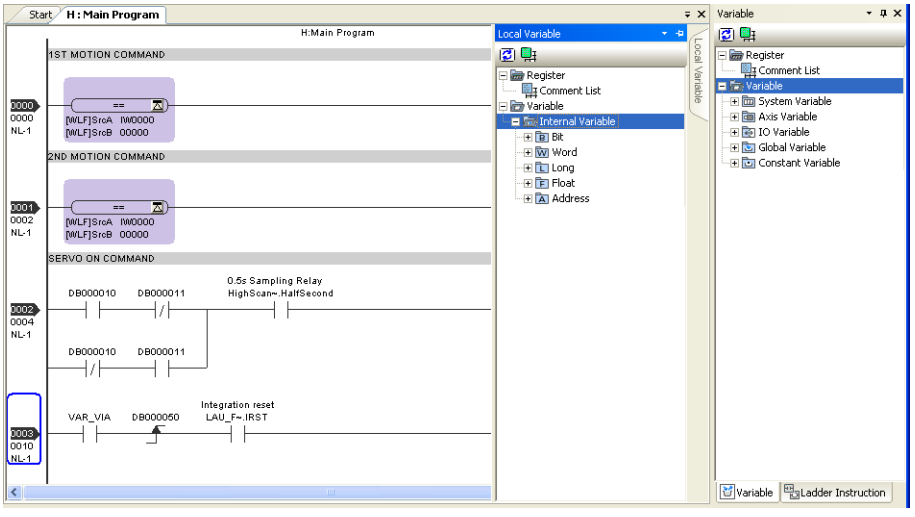
Click the Expand Button (+) to enlarge the ladder instruction stored in the Ladder Instruction Subwindow, and click the Contract Button (–) to shrink the instruction.

- For details on entering instruction objects, refer to *3.3.10 Inserting Instruction Objects*.

(4) Variable Subwindow

The Variable Subwindow is used for entering comments and variables for instruction objects. A variable tree is displayed. Variables and comments are expanded to display by clicking the Expand Button (+). The original display is restored by clicking the Contract Button (–).

The Local Variable Subwindow is displayed by moving the cursor to the **Local Variable** Tab Page.



- For details on entering variables in ladder programs, refer to *3.3.12 Entering and Changing Variables and Register Addresses*.
- For details on variables, refer to *Chapter 5 Variables*.

3.3.3 Updating Subwindow Displays

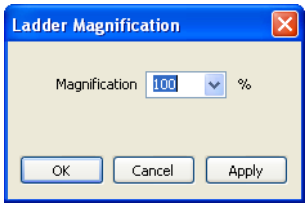
The data displayed in a Ladder, Motion, or Variable Subwindow, or in a comment list, can be updated either by selecting ***View - Update*** from the Main Menu or by pressing the **F5** Key. (For information on comment lists, refer to *5.7 Comment Lists*.)

3.3.4 Changing Edit Window Displays

The Ladder Program Edit Window can be used to change the magnification and either hide or display variables, register addresses, and comments for objects. In addition, various elements (object colors, fonts, etc.) in the Ladder Program Edit Window can be set optionally.

(1) Changing the Display Magnification

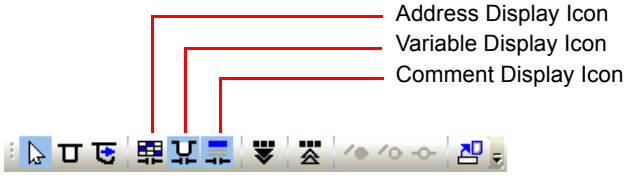
The magnification of the Ladder Program Edit Window can be changed by selecting ***View - Zoom*** from the Main Menu in the **Ladder Magnification** Dialog Box that will be displayed.



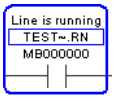
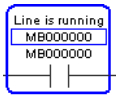
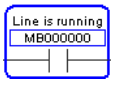
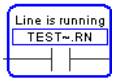
The display magnification can be changed to 10%, 25%, 50%, 75%, 100%, 125%, 150%, 175%, or 200% by clicking the drop-down arrow and selecting the magnification from the list. The number of the display magnification is set in 1% increments by directly entering the number (10% to 500%) into the *Magnification* Box.
Click the **OK** Button to close the dialog box and change the display magnification.
Click the **Cancel** Button to cancel the setting and close the dialog box.
Click the **Apply** Button to change the display magnification while leaving the dialog box open so that the display magnification can be changed again.

(2) Displaying or Hiding Addresses, Variables, and Comments

Register addresses, variables, and comments for instruction objects can be either displayed or hidden by clicking their respective icons in the Ladder Editor Toolbar. (When variables are hidden, the register addresses will be displayed at their display location.) Each click toggles between display and hide. When *Display* is in effect, the background color of the icon is blue.



The display/hide function for register addresses, variables, and comments can be used in the following combinations.

Addresses	Variables	Comments	Object Display	Addresses	Variables	Comments	
√	√	√		√	–	–	
√	√	–		–	√	–	
√	–	√		–	–	√	
–	√	√		–	–	–	

- √ : Display – : Hide
- Even if variables are set to be *Displayed*, the register address will be displayed if no variable is set for that address.

(3) Changing Edit Window Displays (Editor Options)

Object colors, fonts, display methods, and key allocations can be changed by selecting ***View - Editor Option*** from the Main Menu in the **Editor Option** Dialog Box that will be displayed, and then using the four tab pages (Color, Font, Ladder, and Key Allocation).

The following operations are executed by clicking the buttons.

When the **Default** Button Is Clicked:

The set values on the currently selected tab page will be restored to the default values. The set values on the other tab pages will not be changed.

When the **OK** Button Is Clicked:

The current settings in all the tab pages will be overwritten, the **Editor Option** Dialog Box will be closed, and the changed contents will be reflected in the **Ladder Program Edit** Window.

When the **Cancel** Button Is Clicked:

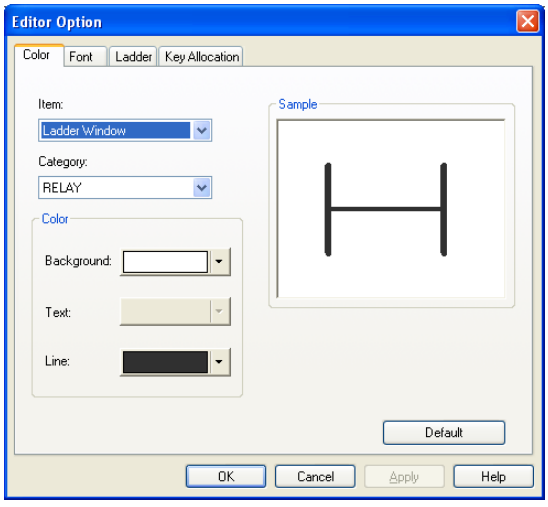
Changes to the settings (in all tab pages) will be cancelled, and the **Editor Option** Dialog Box will be closed.

When the **Apply** Button Is Clicked:

Changes to the settings in all tab pages are overwritten and are immediately reflected. The **Editor Option** Dialog Box remains open, allowing further settings to be made.

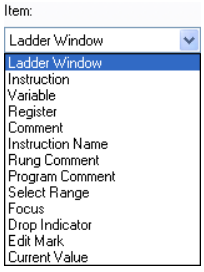
- Be careful when clicking the **Apply** Button, because changes made to settings in other tab pages will be overwritten at the same time.

[a] **Color** Tab Page



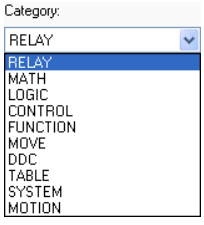
The following items can be set.

Item:



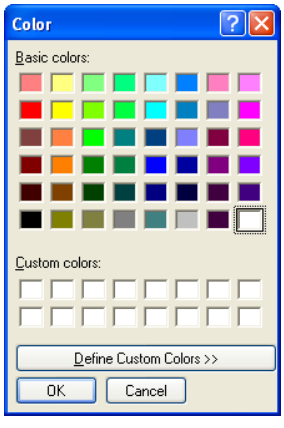
Click the drop-down arrow and select the item to be set. (Refer to the illustration on the left.)
When an item is selected, the display in the Sample Field will be changed to the current value of the selected object.

Category:



Click the drop-down arrow and select the instruction category to be set. (Refer to the illustration on the left.)
If ***Instruction*** or ***Instruction Name*** is selected from the *Item* Combo box and the instruction category is selected from the *Category* Comb box, the display in the *Sample* Field will be changed to the current value of the selected instruction.

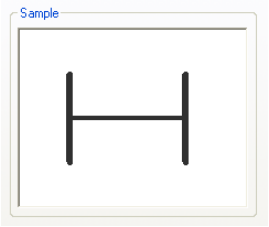
Color:



Click the *Background*, *Text*, or *Line* color box or drop-down arrow to display the **Color** Dialog Box shown on the left.
Select or create a color in the **Color** Dialog Box, and click the **OK** Button. The **Color** Dialog Box will be closed, and the color will be changed in the *Background*, *Text*, or *Line* color box. The color of the object in the *Sample* Field will be replaced by the selected color.

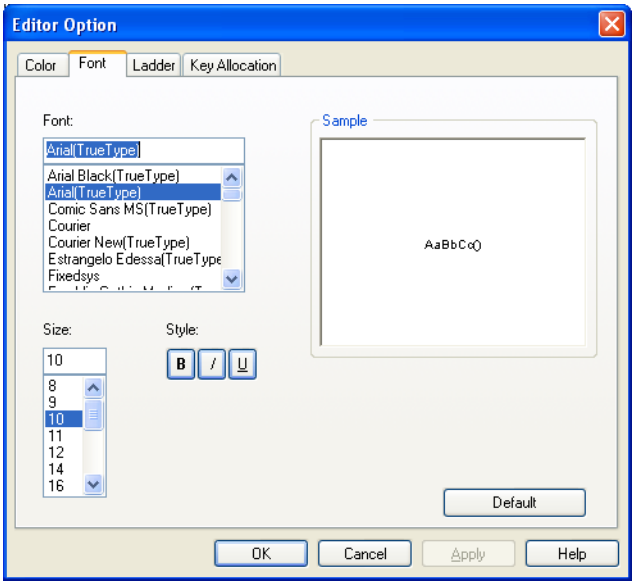
- For information on how to create colors, refer to help by clicking the **?** Button in the **Color** Dialog Box.

Sample:



Displays preview.

[b] **Font** Tab Page



The following items can be set. When a setting is changed, the change is reflected in the text in the *Sample* Field.

Font:

Select from the list the font that is to be used in the **Edit** Window. The fonts displayed in the list will vary depending on which fonts are installed in the personal computer.

Size:

Select from the list the font size (points) that is to be used in the **Edit** Window. The text cursor is displayed by clicking inside the comb box and then a number from 1 to 128 can be entered directly.

If an out-of-range number is entered, and the **OK** Button or the **Apply** Button is clicked, the previously set number will be restored.

Style:

Use the **B**, ***I***, and **U** Buttons to set the font styles to be displayed in the **Edit** Window.

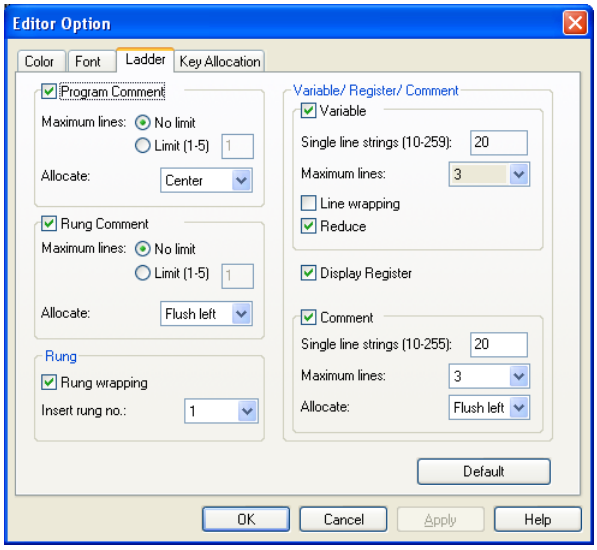
Each of these buttons can be set independently. The setting is toggled between ON and OFF each time a button is clicked.

B: Bold

I: Italic

U: Underline

[c] **Ladder** Tab Page



The following items can be set.

Program Comment:

Check Box:

When the check box is selected, program comments are displayed in the **Edit** Window. The maximum number of lines for entering comments can be set. When the check box is unchecked, program comments are not displayed and the maximum number of lines cannot be set.

- Even when the check box is not cleared, the program comment information is retained without being deleted.

Maximum Number of Lines:

If a *Limit* is set, click inside the box to display the text cursor and then enter the maximum number of lines from 1 to 5.

Allocate:

Comments in the program comment line formatted as *Center*, *Flush Left*, or *Flush Right*.

Rung Comment:

Check Box:

When the check box is selected, rung comments are displayed in the **Edit** Window. The maximum number of lines for entering rung comments can be set. When the check box is unchecked, rung comments are not displayed and the maximum number of lines cannot be set.

- Even when the check box is not cleared, the rung comment information is retained without being deleted.

Maximum Number of Lines:

If a *Limit* is set, click inside the box to display the text cursor and then enter the maximum number of lines from 1 to 5.

Allocate:

Comments in the rung comment line formatted as *Center*, *Flush Left*, or *Flush Right*.

Rung:

Rung Wrapping:

When the check box is selected, rungs will wrap when they are too long. If this check box is cleared, rungs in displays may be long. Use the scroll bar in the **Edit** Window to show the required sections.

Insert Rung No.:

The number of rungs that can be inserted in the **Edit** Window with one insertion operation can be set between 1 and 10.

Variable:

Check Box:

When the check box is selected, variables are displayed in instruction objects. The method for displaying variables can also be set. When the check box is unchecked, variables are not displayed and the setting fields are also invalid.

This setting is linked with the operation of the **Variable Display** Button in the Ladder Editor Toolbar. Refer to *3.3.4 Changing Edit Window Displays* and *(2) Displaying or Hiding Addresses, Variables, and Comments*.

Single line strings:

The maximum number of characters that can be entered in one line in the variable name display for an instruction object can be set from 10 to 259.

Maximum Number of Lines:

The maximum number of lines that can be entered in the variable name display for an instruction object can be set from *1* to *5*, or to *No limit*. Numbers cannot be entered.

Wrapping and Reduce:

Both of these are valid for structure variables (e.g., axis variables such as A1 axis, motion command, motion command status, and command execution flag variables).

When *Wrapping* is selected, variables are wrapped at periods.

When *Reduce* is selected, only the beginning and end of a variable are displayed, and the symbol "~" is displayed in the middle.

The structure variable displays are as shown below.

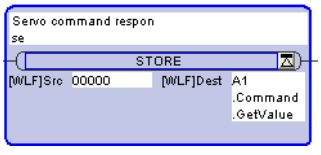
Without Wrapping or Reducing



Without Wrapping; With Reducing



With Wrapping; Without Reducing



With Wrapping and Reducing



Display Register:

When the check box is selected, register addresses are displayed in instruction objects. This setting is linked with the operation of the **Address Display** Button in the Ladder Editor Toolbar. (Refer to *3.3.4 Changing Edit Window Displays* and *(2) Displaying or Hiding Addresses, Variables, and Comments*.)

Comment:

Check Box:

When the check box is selected, comments are displayed in instruction objects. The method for displaying comments can also be set. When the check box is unchecked, comments are not displayed and the setting fields are also invalid.

This setting is linked with the operation of the **Comment Display** Button in the Ladder Editor Toolbar. (Refer to *3.3.4 Changing Edit Window Displays* and *(2) Displaying or Hiding Addresses, Variables, and Comments*.)

Single line strings:

The maximum number of characters that can be entered in one line in the *Comment* Field for an instruction object can be set from 10 to 255.

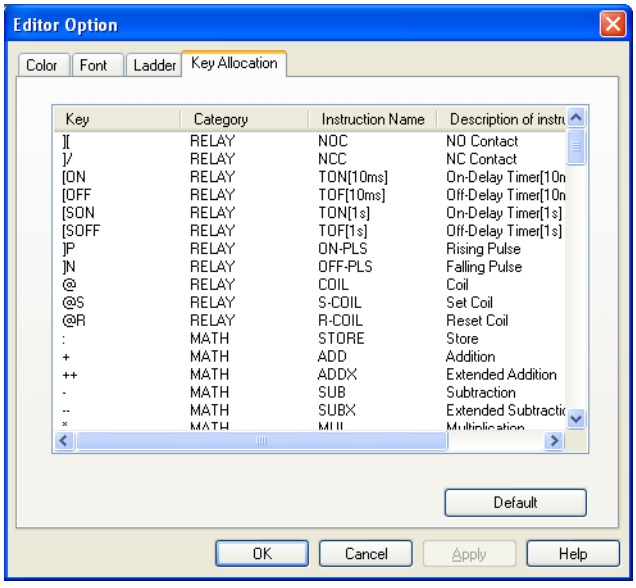
Maximum Number of Lines:

The maximum number of lines that can be entered in the *Comment* Field for an instruction object can be set from *1* to *5*, or to *No limit*. Numbers cannot be entered.

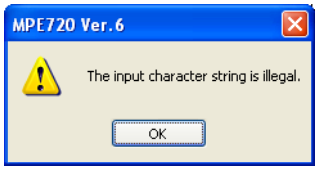
Allocate:

Comments in the instruction object *Comment* Field formatted as *Center*, *Flush Left*, or *Flush Right*.

[d] **Key Allocation** Tab Page



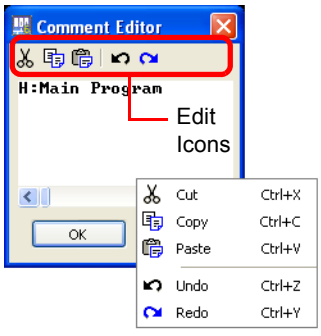
The key allocations used for entering instructions for objects can be changed.
Double-click in the *Key* Field for the instruction that is to be changed, as shown in the window above. When the text cursor is displayed, enter the key that is to be allocated.
If a key that is already being used is allocated or deleted, the following error message will be displayed.



3.3.5 Editing Program Comments

The program name is displayed when the new program is created.
The comment can be edited either by using the Comment Editor or by direct editing in the *Program Comment* Field.

(1) Using the Comment Editor



Pop-up Menu

Double-click a program comment to display the Comment Editor (shown to the left). The following operations can then be executed.

- Characters can be entered.
- Icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
  - For description purposes, all of the icons and menu items shown in the illustration to the left are shown as active.
- Use the **Enter** Key to start a new line.

Click the **OK** Button to complete the comment entering and editing.

(2) Editing Comments Directly in the Program Comment Field

1. Click a program comment to select it, and then select ***Program - Edit Program Comment*** from the Main Menu. Alternatively, right-click the program comment and select ***Edit Program Comment*** from the pop-up menu that will be displayed.

The mode will be changed to the Program Comment Edit Mode, and the entered text will be selected.



2. Edit the text.

- Characters can be entered.
- Main Toolbar icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
- Use the **Ctrl** + **Enter** Keys to start a new line.

3. Press the **Enter** Key to exit the edited program comment.

3.3.6 Inserting and Editing New Rung Comments

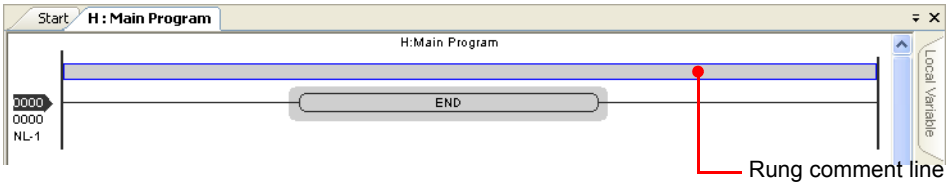
(1) Inserting New Rung Comments

A comment regarding a selected rung can be inserted before that rung. A separate new rung comment can be inserted for a rung that already has a comment inserted.

1. Click to select the rung number block for the rung where the rung comment is to be inserted.

2. Select ***Program - Insert Rung Comment*** from the Main Menu. Alternatively, right-click the rung number block and select ***Insert Rung Comment*** from the pop-up menu that will be displayed.

   The rung comment will be inserted before the selected rung, as shown in the following illustration.

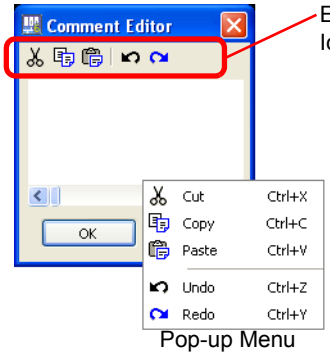


3. Enter or edit the comment.

   Rung comments can be entered or edited either by using the Comment Editor or by editing directly in the *Rung Comment* Field. For details on these two methods, refer to *(2) Using the Comment Editor* and *(3) Editing Directly in the Rung Comment Line*.

- Click the left side of the rung comment line to display an oval. That oval can then be used to edit (copy, paste, move, or delete) the rung comment as an object. Refer to *3.3.7 (4) Deleting Rungs*.

(2) Using the Comment Editor



Pop-up Menu

Double-click a rung comment to display the Comment Editor (shown to the left). The following operations can then be executed.

- Characters can be entered.
- Icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
  - For description purposes, all of the icons and menu items shown in the illustration to the left are shown as active.
- Use the **Enter** Key to start a new line.

Click the **OK** Button to complete the comment entering and editing.

(3) Editing Directly in the Rung Comment Line

1. Click to select the rung comment line, and either select ***Program - Edit Rung Comment*** from the Main Menu or press the **F2** Key. Alternatively, right-click the rung comment line and select ***Edit Rung Comment*** from the pop-up menu that will be displayed.

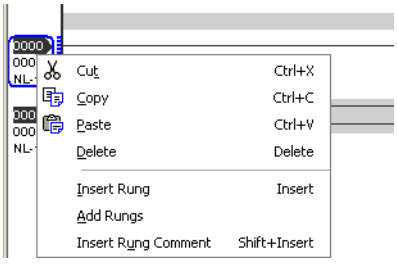
   The mode will be changed to the Rung Comment Edit Mode. If any text has already been entered, it will be selected.

2. Edit the text.

   - Characters can be entered.
   - Main Toolbar icons, short-cut keys, and the rung comment pop-up menu can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
   - Use the **Ctrl** + **Enter** Keys to start a new line.

3. Press the **Enter** Key to exit the edited rung comment and also press the **Esc** Key to cancel the editing operation.

3.3.7 Inserting and Editing New Rungs



Rung Number Block Pop-up Menu

Click to select the rung number block for the new rung that is to be inserted or edited.
Right-click the rung number block to display a pop-up menu with the rung editing operations listed.

- If multiple rungs are selected, only ***Cut***, ***Copy***, and ***Delete*** will be valid in the pop-up menu.

(1) Inserting (Adding) New Rungs

1. Click to select the rung number block at the insertion position.

2. Any of the following operations can be used.

- Select ***Program - Insert Rung*** or ***Add Rungs*** from the Main Menu.
- Right-click the rung number block and select ***Insert Rung*** or ***Add Rungs*** from the pop-up menu that will be displayed.
- Press the **Insert** Key on the keyboard.

With any the above operations, a new rung will be inserted before the selected rung (or after, for ***Add***), and the rung number in the inserted position will be advanced by one.
When ***Insert Rung*** or ***Add Rungs*** is selected, or when the **Insert** Key is pressed, an input guide will be displayed for the inserted rung.

- The number of rungs that can be inserted with a single insertion operation can be changed using the Ladder Tab Page in the **Editor Option** Dialog Box. For details, refer to *3.3.4 (3) Changing Edit Window Displays (Editor Options)*.

(2) Cutting, Copying, and Pasting Rungs

1. Click to select the rung number block to be cut (or copied).

2. With the rung number block selected, select ***Edit - Cut*** (or ***Copy***) from the Main Menu. Alternatively, right-click the rung number block and select ***Cut*** or ***Copy*** from the pop-up menu that will be displayed.

- After the rung has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.

3. Select the rung number block for the insertion position, and select ***Edit - Paste*** from the Main Menu. Alternatively, right-click the rung number block for the insertion position, and then select ***Paste*** from the pop-up menu that will be displayed.

- Rungs from other ladder programs and program files can also be pasted.

(3) Moving Rungs by Dragging

1. Select and drag the number block of the rung that is to be moved.

An UP pointer "⋀" between the rungs will be displayed where the moved rung will be dropped.

2. Release the mouse button when the "⋀" symbol is displayed at the destination position.

(4) Deleting Rungs

1. Select the number block of the rung to be deleted, and then select ***Edit - Delete*** from the Main Menu. Alternatively, right-click the rung number block and select ***Delete*** from the pop-up menu that will be displayed. Another method is to press the ***Delete*** Key on the keyboard.

- Rung comment objects can be moved and deleted using the same methods as in (3) and (4).

3.3.8 Inserting Branches

There are four ways of inserting new branches:

- Individually inserting an empty branch
- Inserting an empty branch by using the branch cursor
- Copying instructions and arranging them in parallel
- Arranging any instructions in parallel
  - Branches can only be inserted on the same rung. Branches cannot be created that straddle multiple rungs.

(1) Individually Inserting an Empty Branch

This method individually inserts an empty branch object.

1. Click the position where the branch is to be inserted to display an input guide.

2. Select ***Program - Insert Branch*** from the Main Menu. Alternatively, right-click the input guide and select ***Insert Branch*** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+B** Keys.

An empty branch will be inserted with branch points before and after the input guide.



(2) Inserting an Empty Branch by Using the Branch Cursor

This method specifies the branch starting and ending points and inserts an empty branch.

1. Click one end of the position where the branch is to be inserted, to display an input guide.

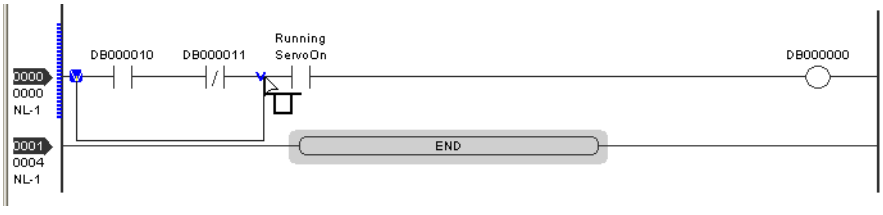
2. Either click the **Create Branch Mode** Icon ( ) in the Ladder Edit Toolbar, or select ***Program - Create Branch Mode*** from the Main Menu. Alternatively, press the **Ctrl+I** Keys.

The cursor will be changed for creating branches.

3. Click the input guide.

The branch will be displayed from the input guide position, and the end point will be moved with the cursor.

4. Move the cursor to display a **V** symbol for the branch end point, and click the **V**.



An empty branch will be inserted around the instruction objects.



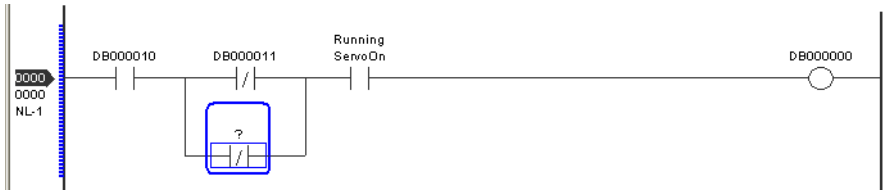
(3) Copying Instructions and Arranging Them In Parallel

This method can be used to copy a selected instruction object and create a parallel branch.

1. Click to select an instruction object to be copied to a branch.

2. Right-click the selected instruction object and select ***Insert Branch*** from the pop-up menu that will be displayed. Alternatively, select ***Program - Insert Branch*** from the Main Menu. Another method is to press the **Ctrl+B** Keys.

A branch with that instruction will be inserted in parallel to the selected instruction object.



- Only one instruction can be arranged on a branch using this operation.
- Items such as variable names and addresses will not be copied for the instruction arranged in parallel.
- For details on entering comments and registers for the inserted instruction, refer to *3.3.13 Editing Comment Fields* and *3.3.12 Entering and Changing Variables and Register Addresses*.
- For information on the meanings and uses of ladder instructions, refer to the *Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual* (SIEZ-C887-13.2).

(4) Arranging Any Instructions in Parallel

A branch with any instruction can be inserted in parallel to the selected instruction object.

1. Click to select the instruction object at the branch insertion position.



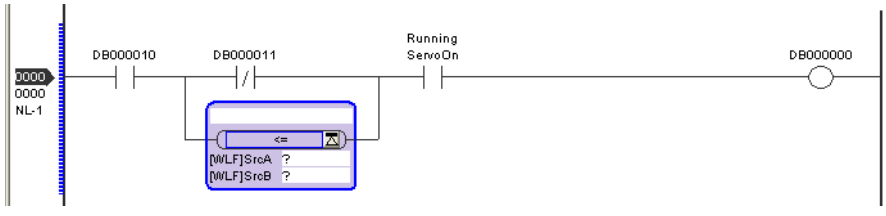
- If more than one instruction object is selected, the last one selected will be taken as the selected object.

2. From the Ladder Instruction Toolbar, click the object to be arranged on the branch.



Alternatively, right-click the selected instruction object and select ***Add Parallel Instruction - [Instruction Type] - [Instruction]*** from the pop-up menu that will be displayed. Another method is to select ***Program - Add Parallel Instruction - [Instruction Type] - [Instruction]*** from the Main Menu. Another method is to drag and drop an instruction from the Instruction Subwindow into the instruction object of step 1.

A branch with the instruction selected in step 2 will be inserted in parallel with the instruction object selected in step 1.



- For details on entering comments and registers for the inserted instruction, refer to *3.3.13 Editing Comment Fields* and *3.3.12 Entering and Changing Variables and Register Addresses*.
- For information on the meanings and uses of ladder instructions, refer to the *Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual* (SIEZ-C887-13.2B).

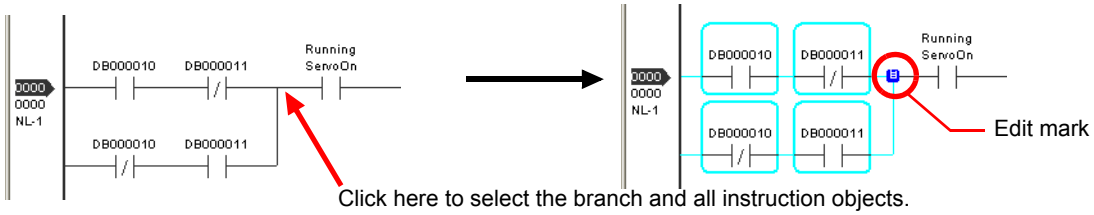
3.3.9 Editing Branches

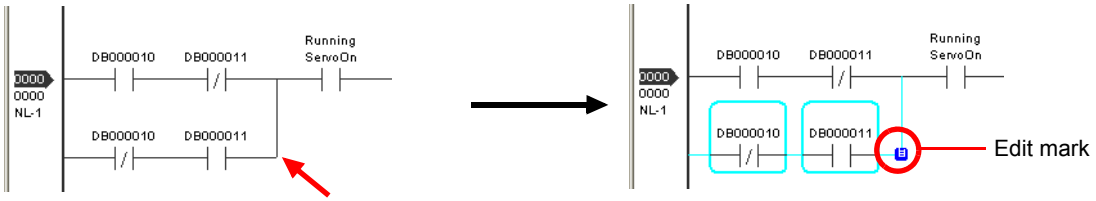
The following editing operations can be used for branches.

- Cutting, copying, and pasting
- Moving branches by dragging
- Changing branch positions
- Deleting branches

(1) Cutting, Copying, and Pasting Branches

1. Click the branching point of the branch that is to be edited. A branch edit mark ( ) will be displayed and the branch that is to be edited will be selected. Be careful when clicking the branching point, because the object that is selected will differ as shown below depending on which place is clicked.





2. Select ***Edit - Cut*** or ***Copy*** from the Main Menu. Alternatively, right-click the edit mark and select ***Cut*** or ***Copy*** from the pop-up menu that will be displayed. Another method is to press the ***Ctrl+X*** Keys (Cut) or the ***Ctrl+C*** Keys (Copy).

- After a branch has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.

3. Click the insertion position to display an input guide on the rung.

- Rungs with other ladder programs displayed in the Ladder Subwindow can also be used.

4. Select ***Edit - Paste*** from the Main Menu. Alternatively, right-click the edit mark and select ***Paste*** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+V** Keys.

When any of the above is executed, the cut or copied branch will be inserted at the input guide position.

(2) Moving Branches by Dragging

1. Select the branch to be moved. The edit mark ( ) will be displayed. (For details on objects of edit marks, refer to *(1) Cutting, Copying, and Pasting Branches*.)

2. Drag the edit mark to display the input guide at the destination position, and release the mouse button.

- Rungs with other ladder programs displayed in the Ladder Subwindow can also be used.

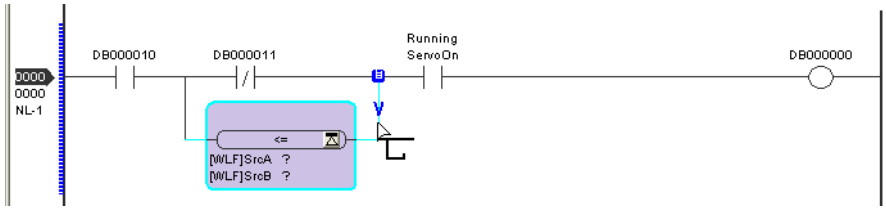
(3) Changing Branch Positions

1. Select the branch position to be changed. The edit mark ( ) will be displayed. (For details on applicable objects of edit marks, refer to *(1) Cutting, Copying, and Pasting Branches*.

2. Click the **Branch Edit Mode** Icon ( ) in the Ladder Editor Toolbar. Alternatively, select ***Program - Branch Edit Mode*** from the Main Menu.

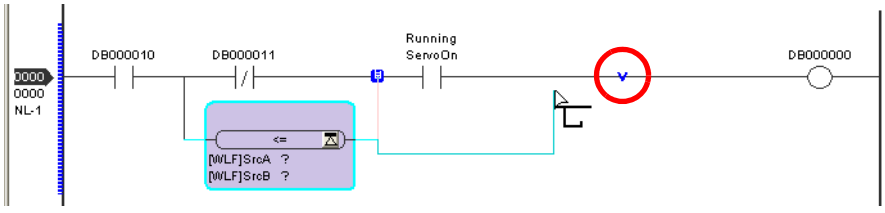
The cursor will be changed for editing branches.

3. Move the cursor to display the Up or Down Arrow at either the input or output side of the branch, whichever side is to be changed, and click the edit mark.

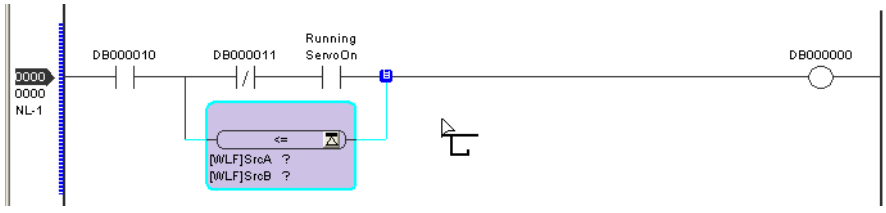


The branch point will then move with the cursor.

4. Move the cursor to display the replacement position **V**.



5. Click the **V** to change the branch point.



- The change of branch positions can be cancelled by pressing the **Esc** Key.

6. Click the **Normal Edit Mode** Icon ( ) in the Ladder Editor Toolbar to exit the Branch Edit Mode and return the cursor to its normal form.

- The cursor will be also returned to its normal form by pressing the **Esc** Key.

(4) Deleting Branches

1. Select the branch to be deleted. The edit mark ( ) will be displayed. (For details on applicable objects of edit marks, refer to *(1) Cutting, Copying, and Pasting Branches*.

2. Select ***Edit - Delete*** from the Main Menu. Alternatively, right-click the edit mark and select ***Delete*** from the pop-up menu that will be displayed. Another method is to press the **Delete** Key.

3.3.10 Inserting Instruction Objects

- For information on the meanings and uses of ladder instructions, refer to *Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual* (SIEZ-C887-13.1).

There are three ways of inserting new ladder instructions:

- Specifying the entry position (input guide or instruction object)
- Entering directly to the input guide
- Inserting a new instruction in parallel with an instruction that is already entered (Inserting branches)

For details on inserting branches, refer to *3.3.8 (3) Copying Instructions and Arranging Them In Parallel* and *3.3.8 (4) Arranging Any Instructions in Parallel*.

(1) Specifying the Entry Position

This section describes how to insert a ladder instruction at an input guide position or before a selected instruction object.

■ Inserting at an Input Guide Position

Click the entry position that the ladder instruction is inserted to display the input guide, and then execute any of the following operations.

- Click an icon in the Ladder Instruction Toolbar.
- Drag and drop an instruction from the Ladder Instruction Subwindow to the input guide.
- Right-click the input guide and select ***Instruction - [Instruction Type] - [Instruction]*** from the pop-up menu that will be displayed.
- Select ***Program - Insert Instruction - [Instruction Type] - [Instruction]*** from the Main Menu.
- Paste a cut or copied instruction object.

■ Inserting before an Instruction Object

Click to select the instruction object at the insertion position, and then execute any of the following operations.

- Right-click the selected object, and select ***Insert Instruction - [Instruction Type] - [Instruction]*** from the pop-up menu that will be displayed.
- Select ***Program - Insert Instruction - [Instruction Type] - [Instruction]*** from the Main Menu.
- Paste a cut or copied instruction object.

(2) Entering Directly to the Input Guide

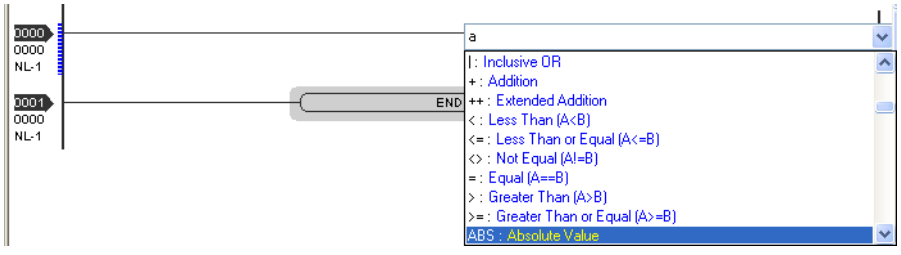
This method is used to directly enter the instruction name and instruction key allocation* to the input guide. The instruction name and instruction key allocation can be selected from the list.

* The instruction key allocation is the allocation of shortcut keys for instruction objects. Example: N.O. contact
The instruction key allocation can be changed. For details, refer to *3.3.4 (3) Changing Edit Window Displays (Editor Options)*.

1. Click the position that the ladder instruction is inserted to display the input guide.

2. Enter the instruction name or instruction key allocation. Alternatively, press any key on the keyboard.

A list of instruction names will be displayed as shown below.



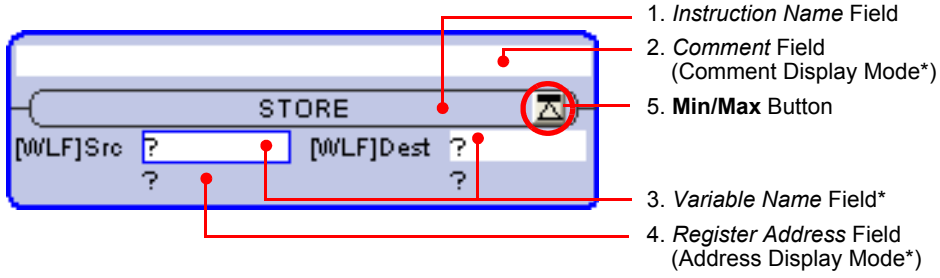
3. Enter the instruction name and instruction key allocation and press the Enter Key, or select the instruction name and instruction key allocation from the list.

The instruction object will be inserted at the input guide position.

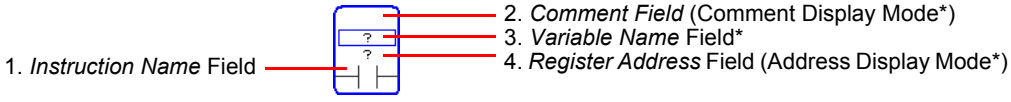
- Insertion of the instruction can be cancelled by pressing the **Esc** Key or clicking outside of the list and field in the Ladder Edit Window before pressing the **Enter** Key or clicking in the list. If an item is selected (highlighted) in the list however, the name and key allocation will be saved even if attempts to cancel the operation are made.

(3) Instruction Object Component Names

The following illustration shows the names of the components in an example of a newly inserted instruction object.



The names will be as follows when the instruction type is RELAY:


1. *Instruction Name* Field
2. *Comment Field* (Comment Display Mode*)
3. *Variable Name* Field*
4. *Register Address* Field (Address Display Mode*)

* The *Comment* Field and *Register Address* Field can be displayed or hidden by toggling the icons in the Ladder Editor Toolbar. Also, whether the *Variable Name* Field, which shows the variable names or addresses, can be displayed or hidden by the same method. For details, refer to *3.3.4 (2) Displaying or Hiding Addresses, Variables, and Comments* .

The components are described below.

1. *Instruction Name* Field

   The names of inserted instructions are displayed here. For RELAY instructions, the RELAY type is displayed.
   - For details on changing instructions that have been entered, refer to *3.3.11 Editing Instruction Objects*.

2. *Comment* Field

   Comments for instruction objects can be edited and displayed here.
   - Comments cannot be edited if the registers are not set.
   - For details on entering and editing comments, refer to *3.3.13 Editing Comment Fields*.

3. *Variable Name* Field

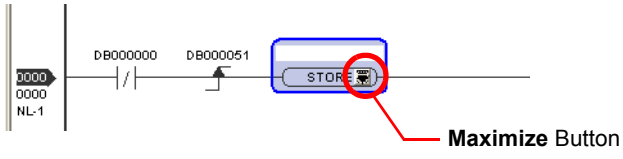
   Variable names for registers used for referencing instructions or storing execution results can be entered and displayed here. (Register addresses are displayed for registers for which no variables are assigned.)
   - For details on entering and editing variables, refer to *3.3.12 Entering and Changing Variables and Register Addresses*.
   - For details on variables, refer to *Chapter 5 Variables*.

4. *Register Address* Field

   Register addresses are displayed here.

5. **Minimize** Button

   Instruction objects can be minimized the display as shown below. The original display size (more detailed) can be restored by clicking the **Maximize** Button.



3.3.11 Editing Instruction Objects

The following editing operations can be executed for instruction objects.

- Cutting, copying, and pasting
- Moving objects by dragging
- Deleting
- Changing instructions

(1) Cutting, Copying, and Pasting

1. Click to select the instruction objects to be cut (or copied).

2. Select ***Edit - Cut or Copy*** from the Main Menu. Alternatively, right-click the selected instruction objects and select ***Cut*** or ***Copy*** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+X** Keys (Cut) or the **Ctrl+C** Keys (Copy).
   - After an instruction object has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.

3. Either click the insertion position to display an input guide, or select the instruction object at the insertion position.
   - Objects from other ladder programs and other project files can also be used.

4. Select ***Edit - Paste*** from the Main Menu. Alternatively, right-click the selected instruction object and select ***Paste*** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+V** Keys.

   If an input guide was displayed in step 3, then the instruction object selected in step 1 will be inserted at that position.
   If an instruction object was selected in step 3, then the instruction object selected in step 1 will be inserted in parallel with that object.

(2) Moving Objects by Dragging

1. Select the instruction object that is to be moved, and then drag it.

   A **V** symbol will be displayed at the rung where the instruction object is dragged.

2. Release the mouse button when the **V** is displayed at the destination position.

(3) Deleting Instruction Objects

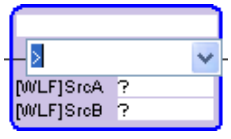
1. Select the instruction object that is to be deleted, and then either select ***Edit - Delete*** from the Main Menu or right-click the instruction object and select ***Delete*** from the pop-up menu that will be displayed. The instruction object can also be deleted by pressing the **Delete** Key.

(4) Changing instructions

Instructions that have already been entered can be changed to other instructions.

1. Select the instruction object that is to be changed, and click the *Instruction Name* Field. Alternatively, select ***Program - Edit Instruction*** from the Main Menu. Another method is to right-click the instruction object and select ***Edit Instruction*** from the pop-up menu that will displayed.

   The instruction name will be selected, and the **List** Button will be displayed.



2. Enter an instruction name and instruction key allocation and press the **Enter** Key, or select an instruction name and instruction key allocation from the list.

The instruction object selected in step 1 will be replaced by the instruction object entered in step 2.

- Insertion of the instruction can be cancelled by pressing the **Esc** Key or clicking outside of the list or field in the Ladder Edit Window before pressing the **Enter** Key or clicking in the list. If an item is selected (highlighted) in the list however, the name and key allocation will be saved even if attempts to cancel the operation are made.

3.3.12 Entering and Changing Variables and Register Addresses

When a variable is entered for an instruction object, a register address and comment can be entered at the same time. Variables can be entered in the following ways.

- Directly entering the address or variable name
- Copying and pasting the variable
- Dragging and dropping the variable

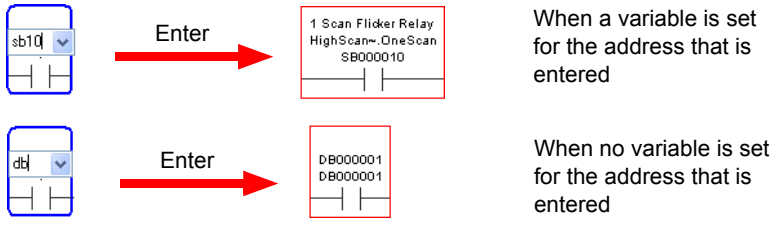
Variables that have already been entered can be changed to other variables.

- Variables are assigned in a database with names called variable names given to combinations of comments, register types, and register addresses. Six types of variables can be referenced from any project file: system variables, axis variables, I/O variables, global variables, and local variables assigned for individual programs. For details on variables, refer to *Chapter 5 Variables*.

(1) Directly Entering Addresses or Variable Names

1. Click to select the *Variable Name* Field of the instruction object for which the variable is to be entered or changed, and then enter the register address or variable name.

2. Press the **Enter** Key to save the variable or address.



- If the entered variable name is too long, ~ is displayed in the spellings.
- When entering addresses, the leading zeroes can be omitted.
- Variable names can be entered in place of addresses for variables assigned as global or local variables.

(2) Copying and Pasting Variables

1. Select the variable that is to be entered or changed in the Variable Subwindow, and then select ***Edit - Copy*** from the Main Menu. Alternatively, right-click the variable to be entered in the Variable Subwindow, and then select ***Copy*** from the pop-up menu that will be displayed.

2. Click to select the *Variable Name* Field of the instruction object for which the variable is to be entered, and then select ***Edit - Paste*** from the Main Menu. Alternatively, right-click the *Variable Name* Field of the instruction object, and then select ***Paste*** from the pop-up menu that will be displayed.

The variable will be entered in the instruction object.

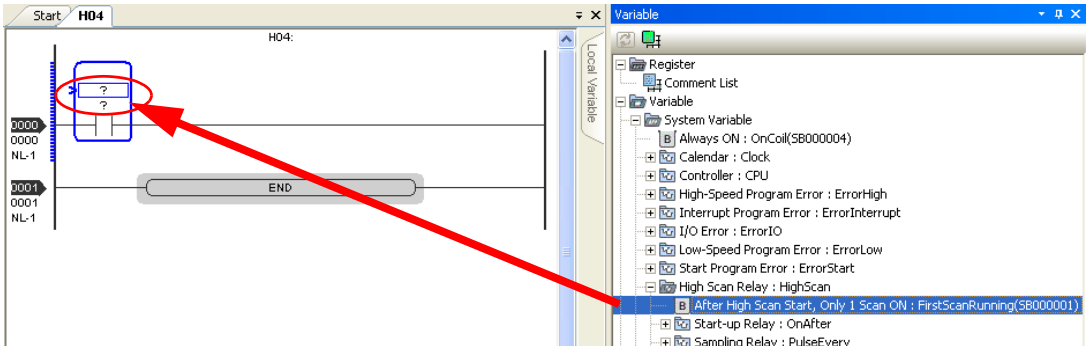


- The variable cannot be entered when anything other than the *Variable Name* Field is selected.

(3) Dragging and Dropping Variables

1. Select the variable that is to be entered or changed in the Variable Subwindow, and then drag it to the instruction object.

2. When > is displayed in the *Variable Name* Field of the instruction object, release the mouse button to enter the variable.



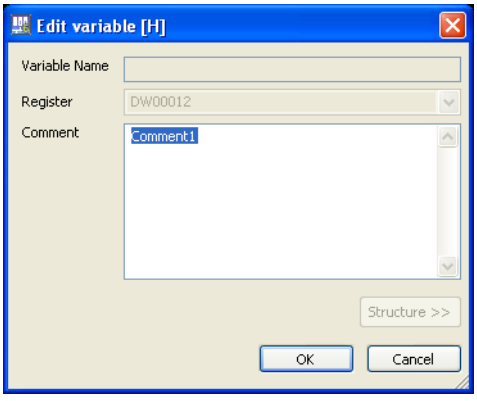
3.3.13 Editing Comment Fields

The *Comment* Field for an instruction object can be edited. The method for editing a *Comment* Field differs depending on whether or not a variable comment is being used in the *Comment* Field.

- A "variable comment being used in the *Comment* Field" means that an instruction belonging to the RELAY, MATH, LOGIC (excluding RCHK instructions), FUNCTION, MOVE, or DDC category is used.
- Even when no variable comment is being used in the *Comment* Field, comments for SEE and FUNC instructions cannot be edited using the Comment Editor. The names for the specified programs are displayed.

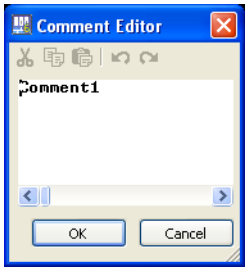
■ Variable Comments

Comments can be edited by double-clicking the *Comment* Field to display the **Edit variable** Dialog Box. For details, refer to *5.3.1 [d] Editing I/O Module Names and Comments*.



■ Comments Other Than Variable Comments

Editing is enabled by double-clicking the *Comment* Field to display the Comment Editor.

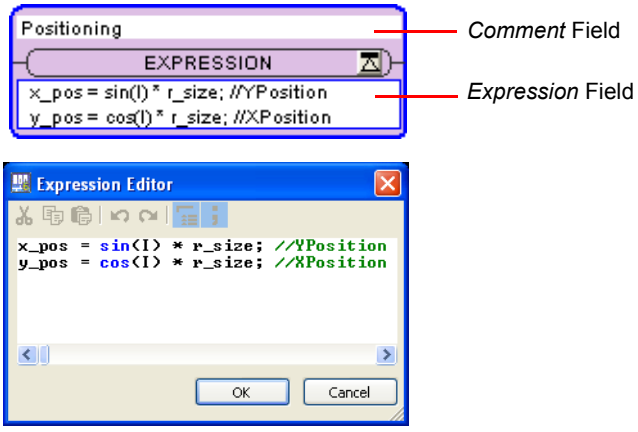


When any of the following operations is performed while the *Comment* Field is selected, the mode will be changed to Comment Edit Mode. If any text has already been entered, that text will be selected.

- Select ***Program - Edit Comment*** from the Main Menu.
- Press the **F2** Key.
- Right-click a comment and select ***Edit Comment*** from the pop-up menu that will be displayed.

3.3.14 Entering and Editing Expressions for EXPRESSION Instructions

The Expression Editor will displayed. Editing can then be enabled by double-clicking the Expression Field in an EXPRESSION instruction object.



Comments are displayed in green in the Expression Editor. Reserved words are displayed in blue.

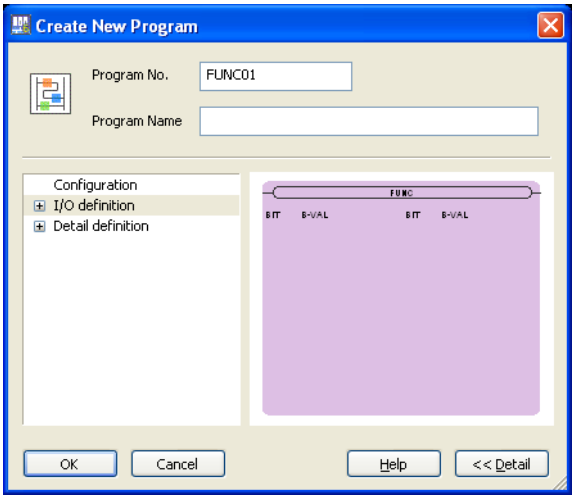
3.3.15 Creating Functions

Functions are also sometimes called "user functions." These are sub programs that can be referenced from any ladder program, and they are created in the Function Folder in the Ladder Subwindow. Once a function has been created, it can be entered into a ladder program as a FUNC instruction.

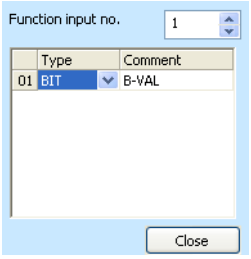
1. Right-click the Function Folder in the Ladder Subwindow and select ***Create New Program*** from the pop-up menu that will be displayed.

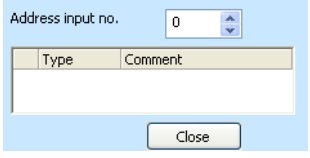
The **Create New Program** Dialog Box will be displayed.

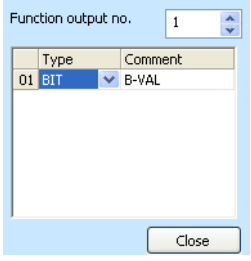
2. Click *I/O definition* on the left side of the dialog box to display *Function input no.*, *Address input no.,* and *Function output no.*



3. Click these to display the respective detail definition windows, and then set the details.

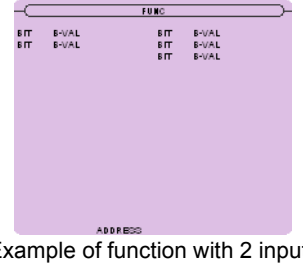






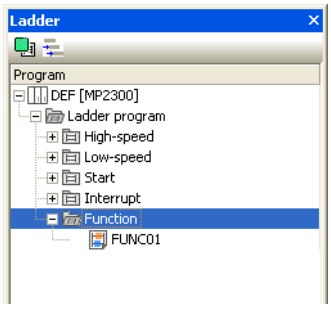
Function Input No.: Set the number of data items to be entered for FUNC instruction objects in the ladder program. Click the *Type* Field and then select BIT, WORD, LONG, or FLOAT as the data type.
Addresses Input No.: Set the number of addresses for FUNC instruction objects.
Function Output No.: Set the number of data objects to be output from FUNC instruction objects. Click the *Type* Field and then select BIT, WORD, LONG, or FLOAT as the data type.

After a function has been set, it will be displayed in the right side of the **Create New Program** Dialog Box.



Example of function with 2 inputs,
3 outputs, and 1 address

4. Click the **OK** Button in the **Create New** Program Dialog Box. The function will be created and will be displayed under the Function Folder in the Ladder Subwindow.

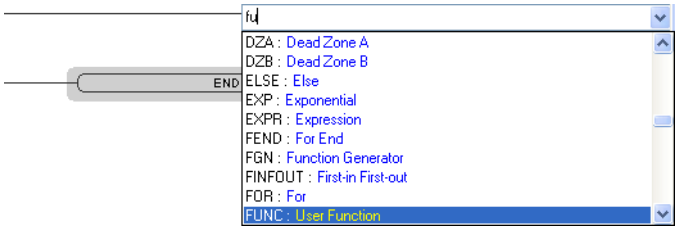


3.3.16 Calling Functions

The following procedure can be used to call functions that have been created under the Function Folder in the Ladder Subwindow for the ladder program.

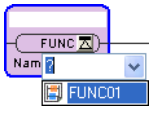
1. Click the position where the function is to be entered in the **Ladder Program Edit** Window. The pointer will change to a "**V**" to show where the data is to be entered.

2. Select *FUNC: User Function* from the entry list for the instruction.

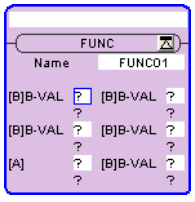


The FUNC instruction object will be entered at the ladder input guide position.

3. Double-click the *Name* Field and enter the function name to be used. Alternatively, select the function name to be used from the list displayed in the *Name* Field.



The FUNC instruction object will be entered.



4. Set the function's I/O registers.

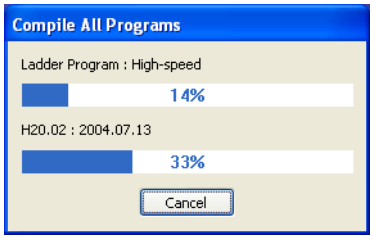
3.3.17 Ladder Program Compiling and Compile Options

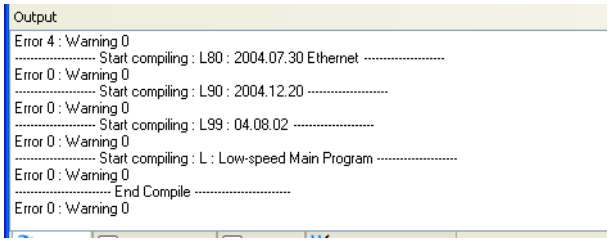
Before transferring a ladder program to the Machine Controller, use the following procedure to compile it, and to create and save compile data. Programs can be compiled individually or all together.

1. Any of the following operations can be used.

- Select ***Compile - Compile*** from the Main Menu.
  → The program displayed in the foreground of the main window will be compiled.
- Select ***Compile - Compile All Programs*** from the Main Menu.
  → All programs, including motion programs, will be compiled.
- Select the file name of the ladder program in the Ladder Subwindow, and then right-click and select ***Compile All Programs*** from the pop-up menu that will be displayed.
  → All ladder programs will be compiled.
- Select a folder or program in the Ladder Subwindow, and then right-click and select ***Compile*** from the pop-up menu that will be displayed.
  → All programs included in the selected folder or program will be compiled.

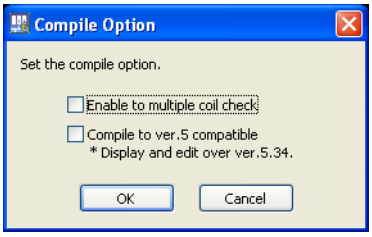
After the ladder programs have been compiled, the compile log will be displayed in the Output Subwindow.




Output
Error 4 : Warning 0
---------- Start compiling : L80 : 2004.07.30 Ethernet ----------
Error 0 : Warning 0
---------- Start compiling : L90 : 2004.12.20 ----------
Error 0 : Warning 0
---------- Start compiling : L99 : 04.08.02 ----------
Error 0 : Warning 0
---------- Start compiling : L : Low-speed Main Program ----------
Error 0 : Warning 0
---------- End Compile ----------
Error 0 : Warning 0

■ Compile Options

With a ladder program displayed in the Main Window, select ***Program - Compile Option*** from the Main Menu. The **Compile Option** Dialog Box will be displayed as shown below. Either of the compile options can then be set. This setting will be applied to all programs.



Enable to Multiple Coil Check:

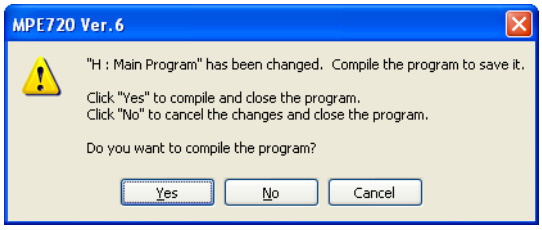
When this option is selected, duplicate coils will be detected during the compile operation.

Compile to Ver.5 Compatible:

When this option is selected, programs can be opened programs in MPE720 version 5.

3.3.18 Compiling when Exiting

Ladder programs are saved when project files are compiled. If any program has not yet been compiled when MPE720 version 6 is exited, or if an edited program is closed without having been compiled, the following message will be displayed.


MPE720 Ver.6
"H : Main Program" has been changed. Compile the program to save it.
Click "Yes" to compile and close the program.
Click "No" to cancel the changes and close the program.
Do you want to compile the program?
Yes
No
Cancel

Yes Button: The applicable program will be compiled and saved.

No Button: The applicable edited contents will not be saved.

Cancel Button: The program will not be compiled and saved, and the **Edit** Window will be displayed again.

- For details on saving program files, refer to *1.7.5 Saving Project Files*.

3.4 Managing Programs in the Ladder Subwindow

The Ladder Subwindow is used for managing ladder programs.
The contents of the Ladder program Folder in a project file are displayed in a tree hierarchy.

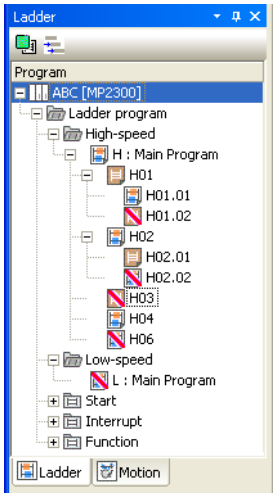


Fig. 3.3 Ladder Subwindow

The following operations can be executed for ladder programs in the Ladder Subwindow:

- Creating programs (Refer to *3.2.1 Creating New Ladder Programs*.)
- Opening edit windows for ladder programs (Refer to *3.2.3 Opening Ladder Programs*.)
- Cutting, copying, and pasting
- Deleting
- Changing names
- Compiling (Refer to *3.3.17 Ladder Program Compiling and Compile Options*.)
- Enabling or disabling
- Displaying properties
- Setting and cancelling passwords

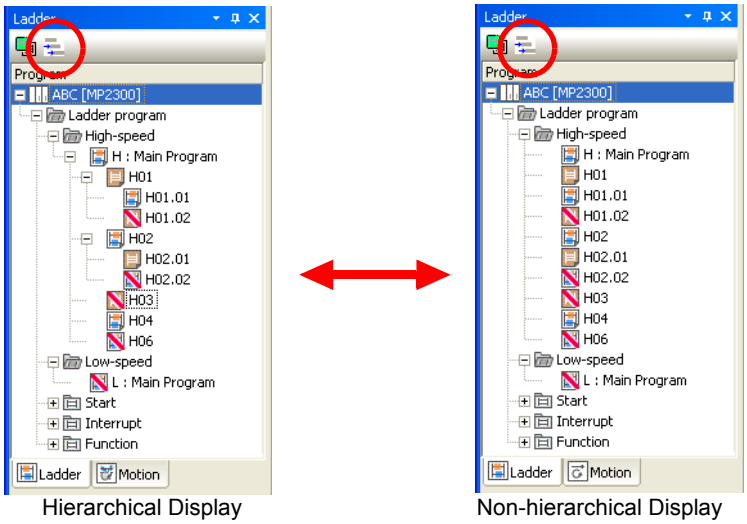
This section describes how to change the display and manage ladder programs in the Ladder Subwindow.

3.4.1 Changing Ladder Subwindow Displays

The Ladder Subwindow display can be changed by the two buttons at the top of the subwindow.

(1) Hierarchical or Non-hierarchical Display

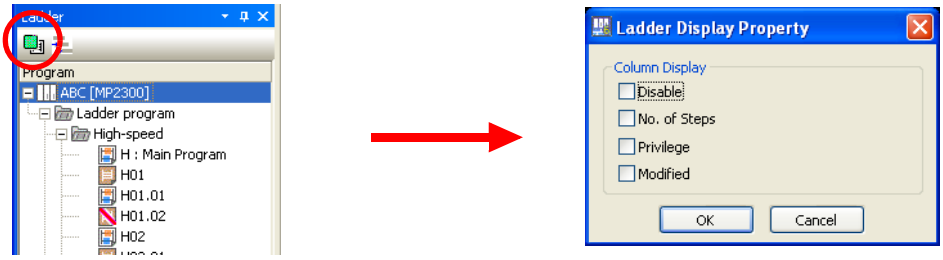
Ladder programs are displayed in a hierarchical structure by default in the Ladder Subwindow. To change to a non-hierarchical structure, click the **Hierarchical Structure Display** Button. The display is toggled each time the buttons are clicked.



Hierarchical Display　　Non-hierarchical Display

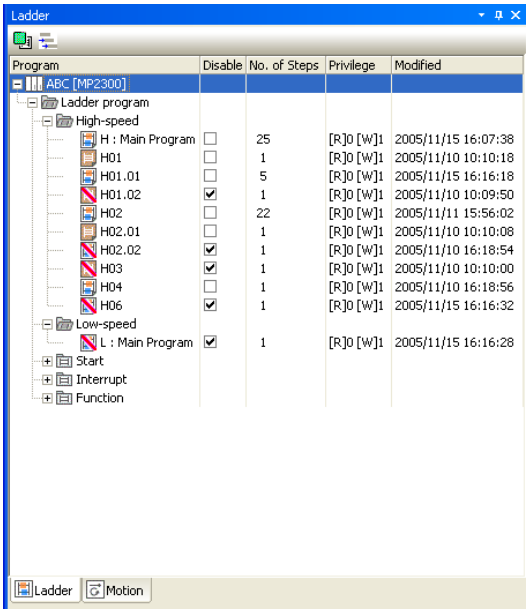
(2) Displaying Properties

The **Ladder Display Property** Dialog Box will be displayed by clicking the **Ladder Program Properties** Button.



- All of the check boxes are not selected by default.
- For details on the *Disable* setting, refer to *3.4.3 (4) Enabling or Disabling Ladder Programs*.
- For details on the *No. of Steps* and *Modified* settings, refer to *3.4.3 (5) Ladder Program Properties*.
- For details on the *Privilege* setting, refer to *3.2.1 Creating New Ladder Programs*.

If information that is to be displayed in the Ladder Subwindow is selected (i.e., if the check box is selected) and the **OK** Button is clicked, that information will be displayed in the Ladder Subwindow.



3.4.2 Setting Passwords for Ladder Programs

Refer to *1.12.3 Setting Passwords for Ladder Programs* for details.

3.4.3 Managing Ladder Program Files

In the Ladder Subwindow, ladder programs can be cut, copied, pasted, deleted, and renamed. They can also be set to be enabled or disabled the ladder programs in the Machine Controller.

(1) Cutting, Copying, and Pasting Ladder Programs

An entire ladder program can be cut or copied and then pasted into either the same project file or another project file.

- This function is valid only when not connected to the Machine Controller (i.e., when offline).
- Before cutting a ladder program,finish editing and close the ladder program.
- Copying (or cutting) and pasting is not possible between function programs and other programs.

1. Open the project file for which the ladder program is to be cut or copied, and display the Ladder Subwindow. (Refer to *1.7.3 Opening Project Files*.)

2. If the paste destination is a separate project file, open that project file in a separate window and display the Ladder Subwindow.

3. In the Ladder Subwindow for the project file that was opened in step 1, select the program that is to be cut or copied.

- A folder, such as the Ladder program Folder of the High-speed Folder, can also be selected. In that case, the operation will apply to all of the ladder programs under the folder. The folder itself cannot be cut or copied.
- When a program is selected, the operation will apply to all of the programs belonging to that program.

4. In the Ladder Subwindow for the project file where the ladder program is to be pasted, select the destination program folder.

5. Right-click the paste destination folder and select ***Paste*** from the pop-up menu that will be displayed. Alternatively, select ***Edit - Paste*** from the Main Menu.

The ladder program cut or copied in step 3 will be over written to the program folder selected in step 4.

(2) Deleting Ladder Programs

- Before using this operation, first close the ladder program that is to be deleted.

1. In the Ladder Subwindow, select the ladder program that is to be deleted.

2. Either select ***Edit - Delete*** from the Main Menu, or right-click the selected program file and select ***Delete*** from the pop-up menu that will be displayed. Alternatively, press the **Delete** Key.

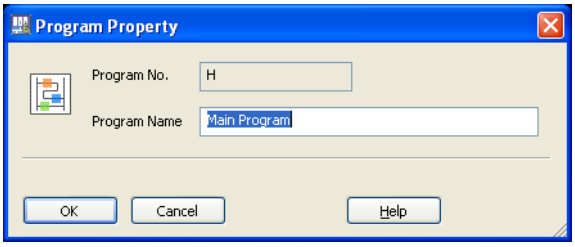
(3) Renaming Ladder Programs

- Before using this operation, first close the ladder program that is to be renamed.

1. Select the ladder program that is to be renamed in the Ladder Subwindow.

2. Right-click the selected program and select ***Rename*** from the pop-up menu that will be displayed.

The **Program Property** Dialog Box will be displayed.



3. Change the name displayed in the *Program No.* Field, and click the **OK** Button.

(4) Enabling or Disabling Ladder Programs

A ladder program can be toggled between enabling and disabling. A disabled program cannot be executed even if it is transferred to the Machine Controller.

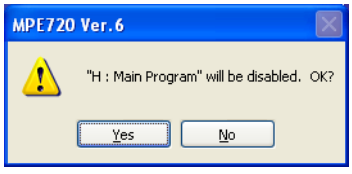
- This operation can be used even for edited ladder programs.

1. Select the program or program folder that is to be enabled or disabled in the Ladder Subwindow.

If a program folder is selected, the operation will apply to the main program in that folder.

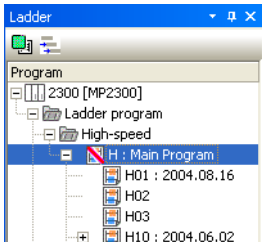
2. Right-click the selected program (or folder) and select ***Enable/Disable*** from the pop-up menu that will be displayed. (If a folder is selected, select *Enable Main Program* or *Disable Main Program*.)

A message asking for confirmation will be displayed.



3. Click the **Yes** Button in the message box. Disable or Enable will be set.

The icon will be displayed for disabled programs.



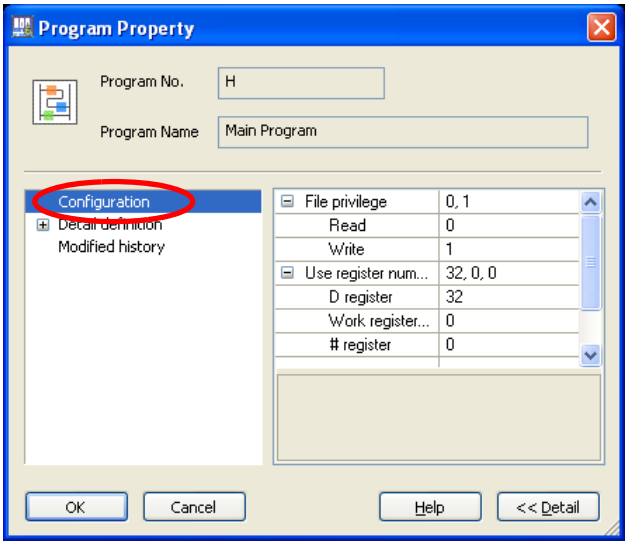
(5) Ladder Program Properties

The properties (configuration, detail definitions, and modified history) of ladder programs can be confirmed.

1. Select the ladder program file for which the properties are to be displayed in the Ladder Subwindow.
2. Right-click the selected program and select ***Property*** from the pop-up menu that will be displayed.

   The **Program Property** Dialog Box will be displayed.

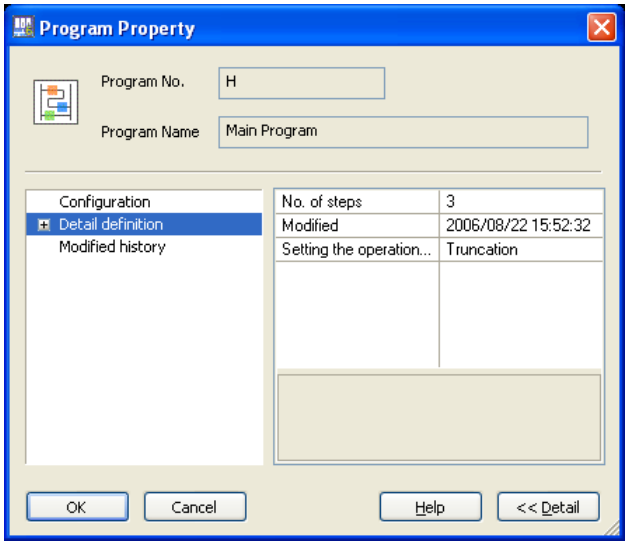
[a] Configuration



- For details on the items to be set for the *Configuration*, refer to *3.2.1 Creating New Ladder Programs*.
- The numbers can be set by clicking the *Read*, *Write*, *D register*, and *# register* Fields.
- For details on renaming ladder programs, refer to *3.4.3 (3) Renaming Ladder Programs*.

[b] Detail definition

The number of steps being executed and the date and time of the latest modification of the program are displayed. The operation to convert data from real-numbers to integers can be displayed and set.



No. of steps

Displays the number of steps being executed. Cannot be edited.

Modified

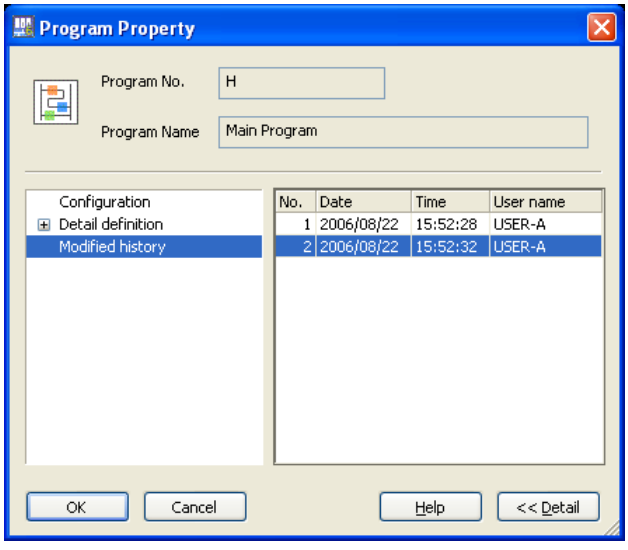
Displays the date and time of the latest modification of the program. Compiling the program will refresh the displayed date and time. Cannot be edited.

Setting the operations

The operation to convert data from real-numbers to integers can be set.

[c] Modified history

The revision history can be confirmed.



Modified history

The latest 10 revision records of the program can be displayed.

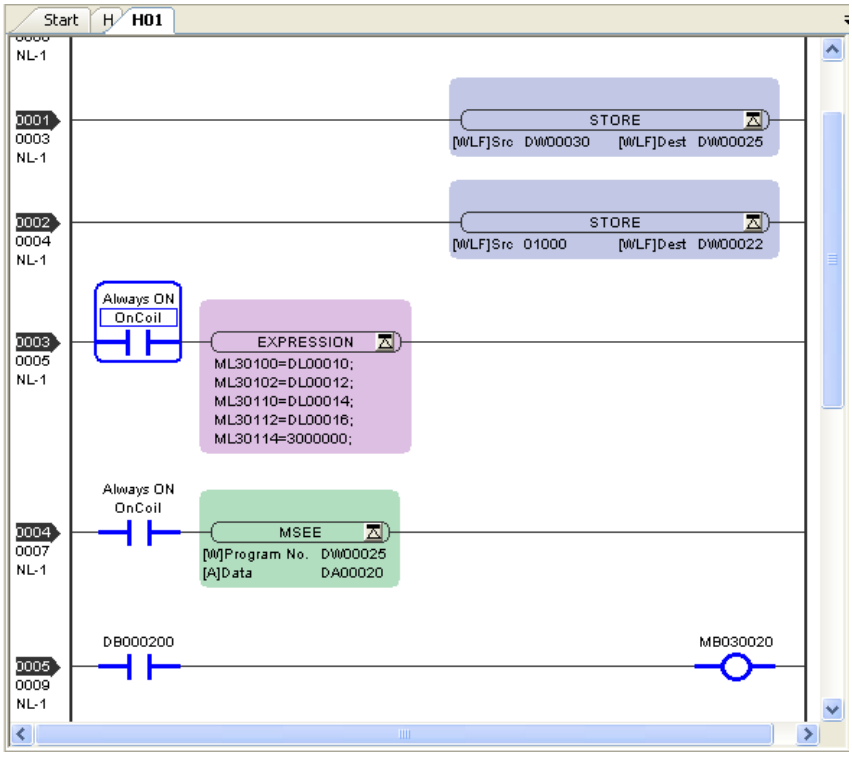
3.5 Debugging Ladder Programs

MPE720 version 6 has the following debugging functions.

- Execution monitoring (Refer to *3.5.1 Monitoring Ladder Program Execution*.)
- Searching and replacing program variables, instructions, and comments (Refer to *3.5.2 Searching and Replacing*.)
- Searching and replacing variable names in project files (Refer to *3.5.3 Searching and Replacing within Projects*.)
- Searching registers being used (Refer to *3.5.4 Cross Reference Searching*.)
- Searching duplicate coils (Refer to *3.5.5 Searching for Duplicate Coils*.)
- Forcing coils ON/OFF (Refer to *3.5.6 Forcing Coils ON/OFF*.)
- Referencing called programs using the SEE instructions (Refer to *3.5.7 Referencing Called Programs*.)

3.5.1 Monitoring Ladder Program Execution

When a ladder program is transferred to the Machine Controller and executed, the instruction currently being executed will be indicated by a blue line* and values for data currently stored in addresses will be displayed in blue.



- For details, refer to *6.2.3 Displaying Online Current Value*.
- Register status during execution can be monitored in a register list. For details, refer to *6.2.1 Register Lists*.

* The display color for execution monitoring can be changed by selecting ***View - Editor Option*** from the Main Menu, and then selecting ***Color - Focus***. (The default setting is blue.) For details, refer to *3.3.4 (3) Changing Edit Window Displays (Editor Options)*.

3.5.2 Searching and Replacing

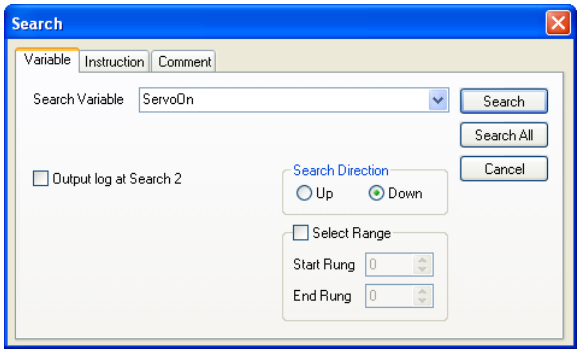
It is possible to search for variables, instructions, and comments used in the program. Registers and comments can be searched and replaced.
The procedures for searching and replacing are described below.

(1) Searching

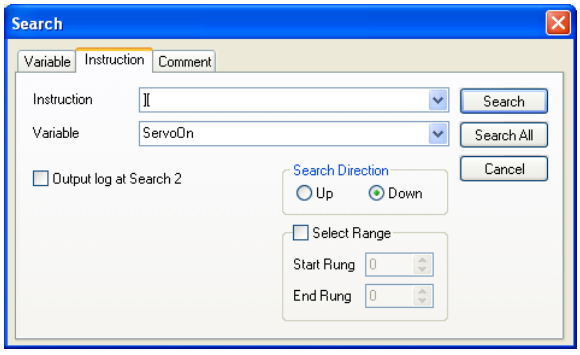
1. Display the program that is to be searched in the foreground of the **Ladder Edit** Window, and select ***Edit - Search*** from the main menu.

The **Search** Dialog Box will be displayed.

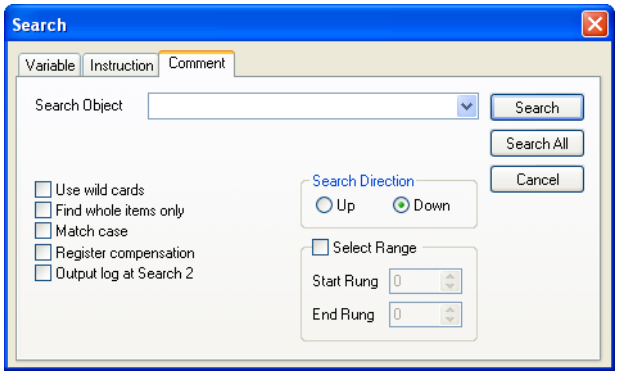
2. Click the **Variable**, **Instruction**, or **Comment** Tab Page, and specify the content of the search.



The **Variable** Tab Page is used to search for variables and register addresses. Variables can be copied and pasted from the Variable Subwindow.



In the **Instruction** Tab Page, enter an instruction name or instruction key allocation in the *Instruction* Field.
Variables can also be entered by dragging, and dropping, copying and pasting from the Variable Subwindow.
The *Variable* Field will be changed to *Program Name* depending on the search object.

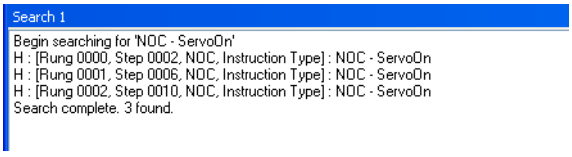


The **Comment** Tab Page is used to search for object, rung, and program comments, and for comments in expressions.

***Use wild card*:** When selected, the wildcards * and ? can be used in searches.
***Search agree completely item*:** When selected, only exact matches between character strings in comments and search objects will be searched. Whether distinctions are made between uppercase and lowercase, however, depends on the *Case-sensitive* setting.
***Case-sensitive*:** When selected, a distinction is made between uppercase and lowercase characters.
***Register compensation*:** When selected, a character string that was entered as a search object is converted to the correct register notation when it is recognized as a register.
***Output log at Search 2*:** If *Output log at Search 2* is selected, the search results will be output in the Search 2 Subwindow, and the output contents of the Search 1 Subwindow will not be changed. If *Output log at Search 2* is not selected, the search results will be output in the Search 1 Subwindow.
***Select range*:** When selected, the search range can be set by specifying the start rung and end rung.

3. Start the search.

If the **Search** Button is clicked, the relevant instruction object will be searched and selected.
If the **Search All** Button is clicked, the search results will be displayed in the Search 1 or Search 2 Subwindow.


Search 1
Begin searching for 'NOC - ServoOn'
H : [Rung 0000, Step 0002, NOC, Instruction Type] : NOC - ServoOn
H : [Rung 0001, Step 0006, NOC, Instruction Type] : NOC - ServoOn
H : [Rung 0002, Step 0010, NOC, Instruction Type] : NOC - ServoOn
Search complete. 3 found.

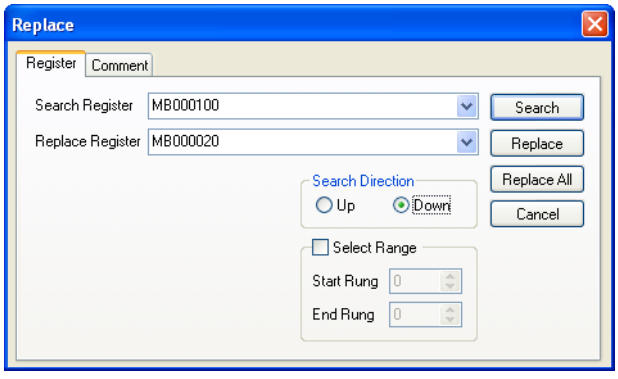
4. End the search by clicking the **Cancel** Button or the **Close** Button (**X**).

(2) Replacing

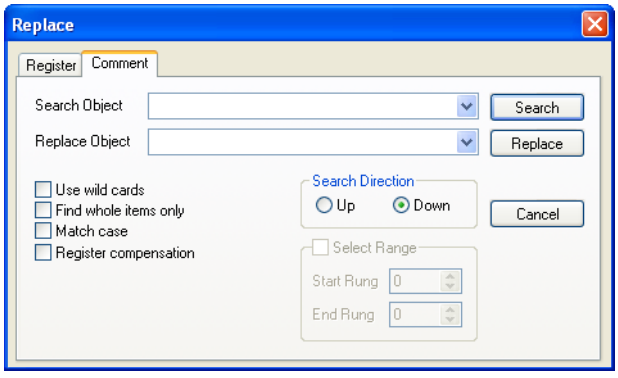
1. Display the program that is to be searched and replaced in the foreground of the Ladder Edit Window, and select ***Edit - Replace*** from the Main Menu.

The **Replace** Dialog Box will be displayed.

2. Select the ***Register*** *or* ***Comment*** Tab Page, and specify the search object and the replace object.



The **Register** Tab Page is used to find and replace register addresses.



The **Comment** Tab Page is used to find and replace object, rung, and program comments, and comments in expressions.

Use wild card: When selected, the wildcards * and ? can be used in searches.

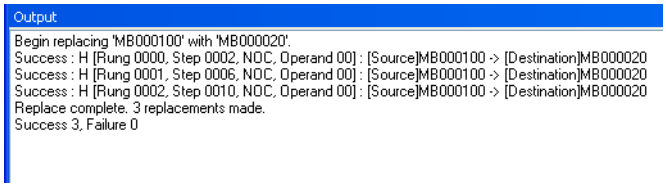
- If either * or ? is used in the *Replace Object*, it will be treated not as a wildcard but as a character.

Select range: When selected, the search range can be set by specifying the start rung and end rung.

3. Start the search and replace operation.

When the **Search** Button is clicked, the relevant instruction object will be searched and selected. When the **Replace** Button is clicked, the selected item will be replaced by the characters in either the *Replace Register* Field or the *Replace Object* Field.

If the **Replace All** Button is clicked on the **Register** Tab Page, all of the relevant registers will be replaced and the replacement results will be displayed in the Output Subwindow.


Output
Begin replacing 'MB000100' with 'MB000020'.
Success : H [Rung 0000, Step 0002, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Success : H [Rung 0001, Step 0006, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Success : H [Rung 0002, Step 0010, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Replace complete. 3 replacements made.
Success 3, Failure 0

4. End the replace operation by clicking the **Cancel** Button or the **Close** Button (**X**).

3.5.3 Searching and Replacing within Projects

All ladder programs and motion programs (or in specified programs) within a project can be searched for variables. Registers and addresses can be searched and replaced.

- This function is enabled only when not connected to a Machine Controller (i.e., when offline).
- CP ladder programs cannot be the objects of search and replace operations in projects.

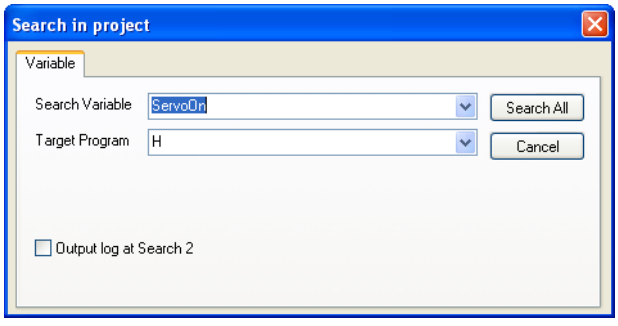
The procedures for searching and replacing within projects are described below.

(1) Searching in Projects

1. Display the program that is to be selected in the foreground of the **Ladder Edit** Window, and select ***Edit - Search in Project*** from the main menu.

The **Search in Project** Dialog Box will be displayed.

2. Set the variable (or address) to be searched and the name of the target program.



Variables can also be entered by dragging, dropping, copying and pasting from the Variable Subwindow.
Multiple programs can be specified in the *Target Program* Field by separating them with commas and spaces.
Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

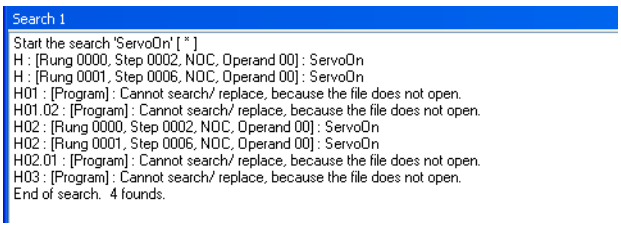
, H, L, I*, A*, F* (all functions), MPM*, MPS*

- Wildcards can be used only in the above forms. They cannot be used in forms such as H01.*.

If *Output log at Search 2* is selected, the search results will be output in the Search 2 Subwindow, and the output contents of the Search 1 Subwindow will not be changed. If *Output log at Search 2* is not selected, the search results will be output in the Search 1 Subwindow.

3. Starts searching.

A progress bar will be displayed during the search, and the search results will be displayed in the Output Subwindow.


Search 1
Start the search 'ServoOn' [*]
H : [Rung 0000, Step 0002, NOC, Operand 00] : ServoOn
H : [Rung 0001, Step 0006, NOC, Operand 00] : ServoOn
H01 : [Program] : Cannot search/ replace, because the file does not open.
H01.02 : [Program] : Cannot search/ replace, because the file does not open.
H02 : [Rung 0000, Step 0002, NOC, Operand 00] : ServoOn
H02 : [Rung 0001, Step 0006, NOC, Operand 00] : ServoOn
H02.01 : [Program] : Cannot search/ replace, because the file does not open.
H03 : [Program] : Cannot search/ replace, because the file does not open.
End of search. 4 founds.

4. End the search by clicking the **Cancel** Button or the **Close** Button (**X**).

(2) Replacing in Projects

- After a replace operation in a project has been completed, compiling and saving will be executed. The replace operation cannot be undone to restore the project to its previous status, so be sure to back up any essential files before performing the operation.

- If a motion program is opened by the Engineering Manager before a replace operation, the program will not be automatically updated. Close any open motion programs before executing a replace operation.

1. Display the program that is to be selected in the foreground of the **Ladder Edit** Window, and select ***Edit - Replace in Project*** from the main menu.

The Replace in the **Project** Dialog Box will be displayed.

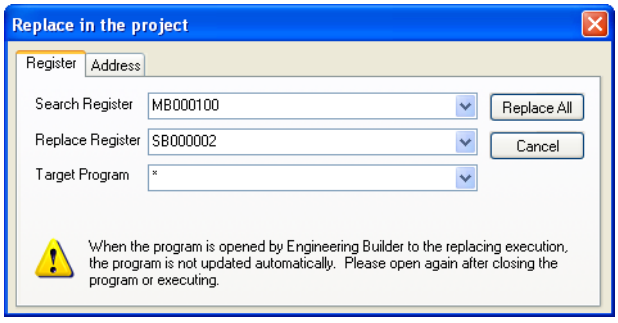
2. Set the variable (or address) to be searched and the name of the target program.

Variables can also be entered by dragging, dropping, copying, pasting from the Variable Subwindow.
Multiple programs can be specified in the *Target Program* Field by separating them with commas and spaces.
Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

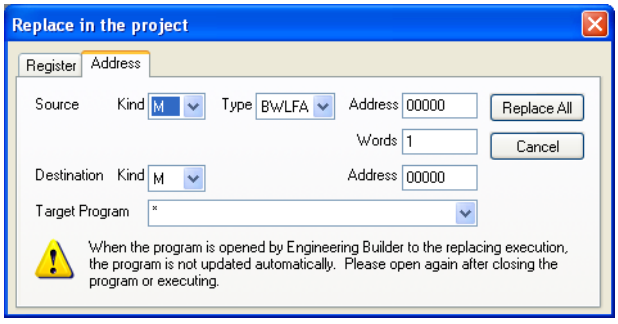
, H, L, I*, A*, F* (all functions), MPM*, MPS*

- Wildcards can be used only in the above forms. They cannot be used in forms such as H01.*.

3. Click the **Register** or **Address** Tab Page, and specify the search object and the replace object.



*The **Register** Tab Page is used for simple register replacements.*



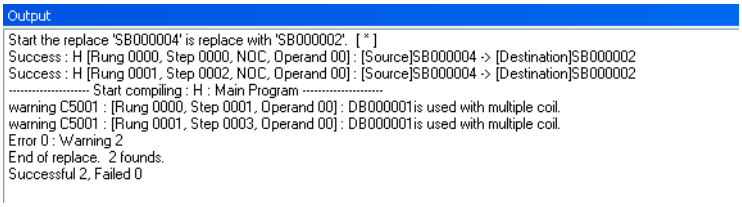
*The **Address** Tab Page is used to replace registers that match* certain conditions.

Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

, H, L, I*, A*, F*, MPM*, MPS*

4. Starts searching and replacing.

The relevant registers or addresses will be replaced. A progress bar will be displayed during the operation, and the results will be displayed in the Output Subwindow.


Output
Start the replace 'SB000004' is replace with 'SB000002'. [*]
Success : H [Rung 0000, Step 0000, NOC, Operand 00] : [Source]SB000004 -> [Destination]SB000002
Success : H [Rung 0001, Step 0002, NOC, Operand 00] : [Source]SB000004 -> [Destination]SB000002
---------- Start compiling : H : Main Program ----------
warning C5001 : [Rung 0000, Step 0001, Operand 00] : DB000001is used with multiple coil.
warning C5001 : [Rung 0001, Step 0003, Operand 00] : DB000001is used with multiple coil.
Error 0 : Warning 2
End of replace. 2 founds.
Successful 2, Failed 0

- The replace operation can be aborted by clicking the **Cancel** Button in the dialog box of the progress bar, but the program will be compiled and saved with whatever items have already been replaced up to that point.
- If an error occurs while the program is being compiled, the items will not be replaced.

5. End the replace operation by clicking the **Cancel** Button or the **Close** Button (**X**).

After the replace operation has been completed, the register or variable replacements will be displayed.

3.5.4 Cross Reference Searching

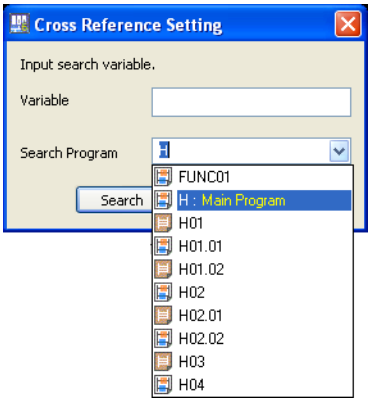
Variables or registers used in a program can be searched.

1. Select ***Debug - Cross Reference*** from the Main Menu.

The **Cross Reference Setting** Dialog Box will be displayed.

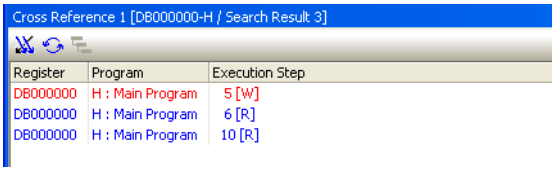
2. Set the variable (or register) to be searched and the name of the target program.

The target program can be selected from the list. Variables can also be entered by dragging, dropping, copying and pasting from the Variable Subwindow.

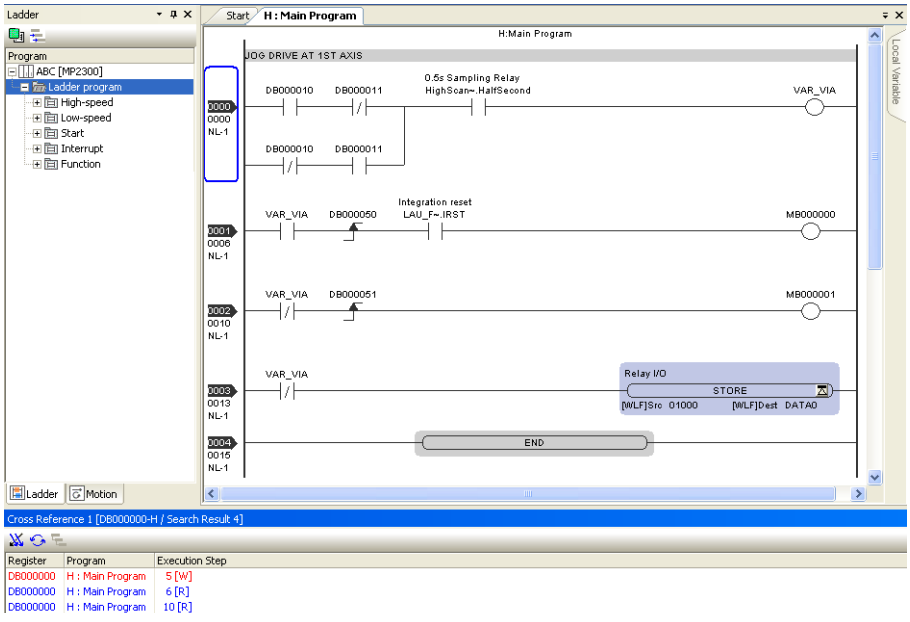


3. Click the **Search** Button.

The cross reference searching will be executed, and the search results will be displayed in the Cross Reference 1 Subwindow. Input registers will be displayed in blue, and output registers in red.


Cross Reference 1 [DB000000-H / Search Result 3]
Register
Program
Execution Step
DB000000 H : Main Program 5 [W]
DB000000 H : Main Program 6 [R]
DB000000 H : Main Program 10 [R]

The program will be opened and the objects in the selected register will be selected by double-clicking on a displayed register.



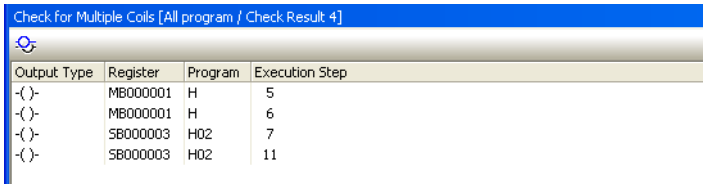
3.5.5 Searching for Duplicate Coils

A search for duplicate coils (coils using the same register) can be done in all the ladder programs, and the search results can be displayed.

- If the Project Link Connection is used, and the data in the project file does not match the data in the Machine Controller, then the results in the Machine Controller may differ when the search for duplicate coils is executed.
  To search for duplicate coils when the Project Link Connection is used, transfer the data to the project file by executing the **Read from Controller** command in advance.
  To search for duplicate coils when the Direct Connection is used, project file data is also displayed for the duplicate coil search.

1. Select ***Debug - Check for Multiple Coils*** from the Main Menu.

The search will be started, and the results will be output to the Check for Multiple Coils Subwindow.



- If *Enable to Multiple Coil Check* is selected in the compile options, a search for duplicate coils will also be executed while the program is being compiled and the results will be displayed in the Output Subwindow as a warning.
- For details on the compile options, refer to *3.3.17 Ladder Program Compiling and Compile Options*.

3.5.6 Forcing Coils ON/OFF

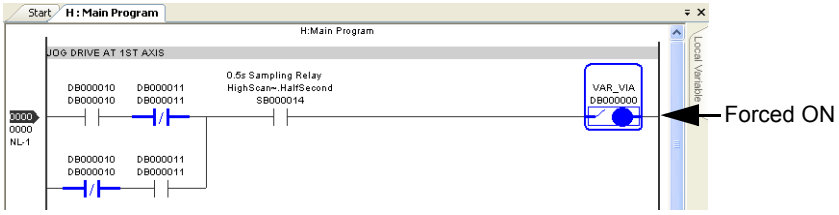
(1) Setting Coils to Forced ON/OFF in the Ladder Program

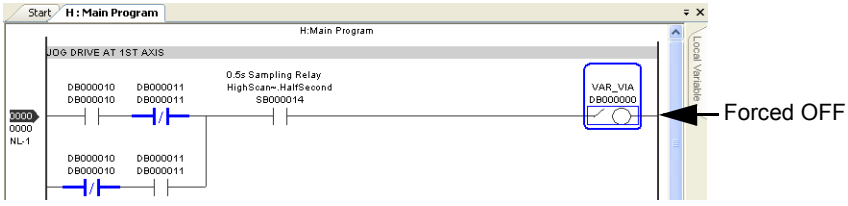
Programs can be monitored by forcibly turning specified coil objects ON or OFF in the **Ladder Program Edit** Window.

1. Select the coil to be forcibly turned ON or OFF.

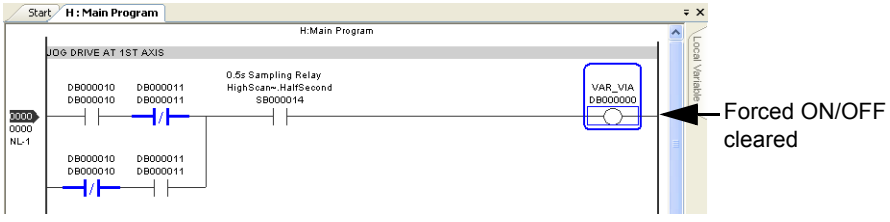
2. Select ***Debug - Force ON*** or ***Force OFF*** from the main menu.

The selected coil will be forcibly connected or disconnected.





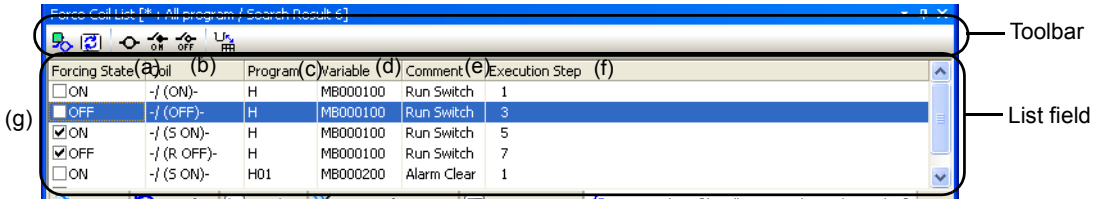
3. To clear the forced ON or forced OFF, select ***Debug - Clear Forced ON/OFF*** from the main menu.



(2) Changing ON/OFF Status of Forced Coil

The ON/OFF status of the forced coil in all ladder programs can be displayed in a list.
In the Forced Coil List Subwindow, the ON or OFF status of forced coils in all programs can be changed or cleared.
The search results are displayed in the Forced Coil List Subwindow.
The components of the Forced Coil List Subwindow are as follows:

The Forced Coil List Subwindow consists of the list field and the toolbar containing buttons, each with a distinctive icon, to search for forced coils, re-search, and change the forced status.



Forced Status Coil Search Condition Setting Button ( )
Click this icon to display the **Forced Coil Condition Setting** Dialog Box. Specify the programs where forced status coil search is to be executed, and click the **Search** Button to start the search.

Research Button ( )
Click this icon to research forced status coils in the programs specified in the Forced Coil Condition Setting Subwindow.

Forced Status Clear Button ( )
Select the check boxes of the coils for which forced status is to be cleared, and click this icon to clear the forced status of the selected coils.

Forced ON Button ( )
Select the check boxes of the coils to be forcibly turned ON, and click this icon to forcibly turn ON the selected coils.

Forced OFF Button ( )
Select the check boxes of the coils to be forcibly turned OFF, and click this icon to forcibly turn OFF the selected coils.

Variable Display Switching Button ( )
Click this icon to switch the display method of registers that the coil uses from/to Register to/from Variable.

(a) Forcing State
Indicates whether the searched coil is forced ON or OFF.

(b) Coil
Displays the searched coils.
The following six coil symbols are used according to coil type and status.

Coil Type	Coil Symbol	
	ON	OFF
Coil	-/ (ON)-	-/ (OFF)-
Set coil	-/ (S ON)-	-/ (S OFF)-
Reset coil	-/ (R ON)-	-/ (R OFF)-

(c) Program
Displays the name of the program where the coil is searched.

(d) Variable
Displays the variables or registers that are set for the searched coil.

(e) Comment
Displays the comments set for the variable.

(f) Execution Step
Displays the execution step number where the searched coil is located.
Refer to *3.3.1 Ladder Program Edit Window* for details.

(g) Check Box

Select the check boxes of the coils for which forced operations such as Forced ON, Forced OFF, and Forced Status Clear are to be executed. Select an icon on the toolbar or select a command from the pop-up menu to set or change the forced status of all the selected coils.

[a] Search in Forced Coil List Subwindow

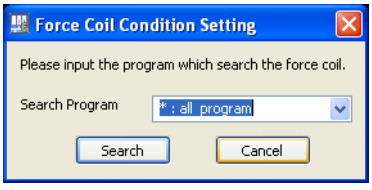
1. Display the Forced Coil List Subwindow.

- The Forced Coil List Subwindow can be displayed or hidden by selecting ***View*** - ***Other Windows*** - ***Forced Coil List*** from the Main Menu.

2. Select ***Debug*** - ***Forced Coil List*** from the main menu.

The forced status coils will be searched in all programs, and the search results will be displayed in the Forced Coil List Subwindow.

To specify the programs in which the search is to be executed, click the icon  (forced coil search condition setting) to display the **Forced Coil Condition Setting** Dialog Box.



Search Program

Select the program for which the search for forced status coils is to be executed. Type the program name or select the program from the drop-down list box.

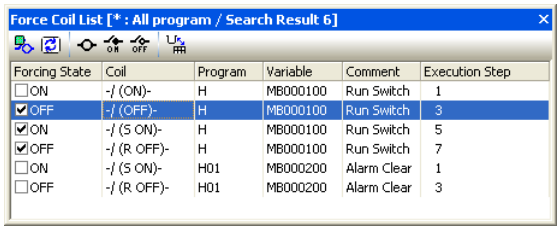
Search

Click this button to start search for forced status coils in the selected program and to display the forced status coils in a list.

Cancel

Click this button to cancel the search operation.

3. The search results will be displayed in the Forced Coil List Subwindow.



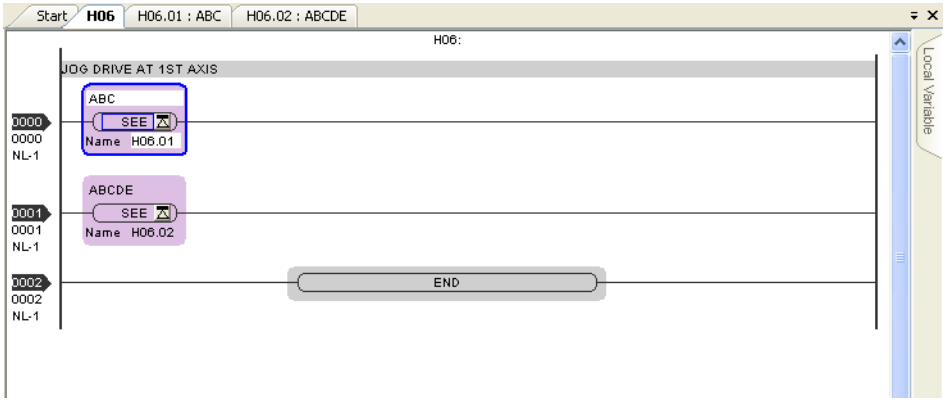
Forcing State	Coil	Program	Variable	Comment	Execution Step
☐ ON	-/ (ON)-	H	MB000100	Run Switch	1
☑ OFF	-/ (OFF)-	H	MB000100	Run Switch	3
☑ ON	-/ (S ON)-	H	MB000100	Run Switch	5
☑ OFF	-/ (R OFF)-	H	MB000100	Run Switch	7
☐ ON	-/ (S ON)-	H01	MB000200	Alarm Clear	1
☐ OFF	-/ (R OFF)-	H01	MB000200	Alarm Clear	3

- Right-click in the list field of the Forced Coil List Subwindow and select ***Check All*** or ***Uncheck All*** from the pop-up menu that appears. All the check boxes of forced status coils will be selected or cleared at once.
- In the list in the Forced Coil List Subwindow, select or double-click a row to jump to the corresponing coil in the ladder program. Alternatively, select a row and right click to display the pop-up menu, and select ***Jump*** from the pop-up menu.
  If the corresponding ladder program is not already open, it will be automatically opened to jump to the corresponding coil.
- Right-click in the list field of the Forced Coil List Subwindow and select ***Cross Reference*** from the pop-up menu that appears. Alternatively, select ***Debug*** - ***Cross Reference*** from the Main Menu. The registers set for the forced status coil will be searched and the search results will be displayed in the Cross Reference Subwindow.
- If a ladder program is edited while the search results are displayed, the coils of the program that being edited is shown in gray.

3.5.7 Referencing Called Programs

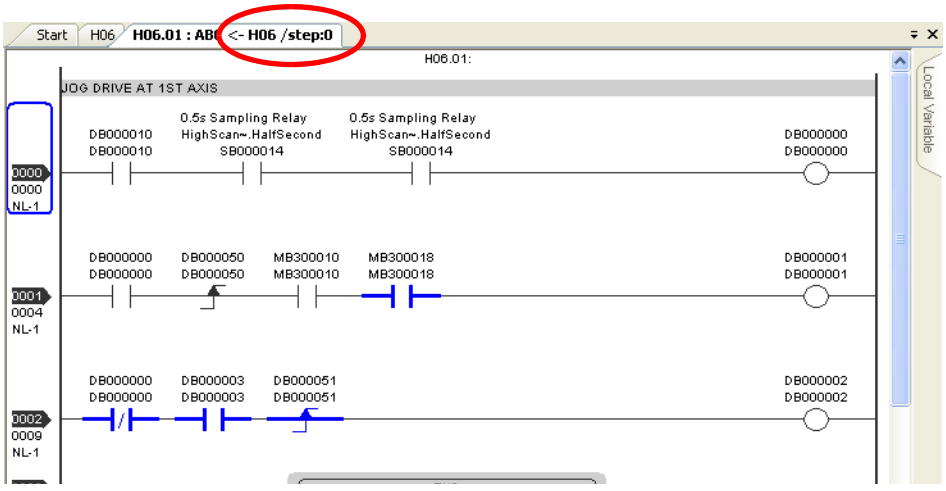
Programs called using the SEE or FUNC instructions can be opened and confirmed.

1. Select the SEE or FUNC instruction object for the program to be checked, and select ***Debug - REFER*** from the Main Menu.



2. The referenced program will be displayed in the Edit Window.

Program information such as **<-H06/step:0** in the diagram below will be displayed in the tab for the referenced program.

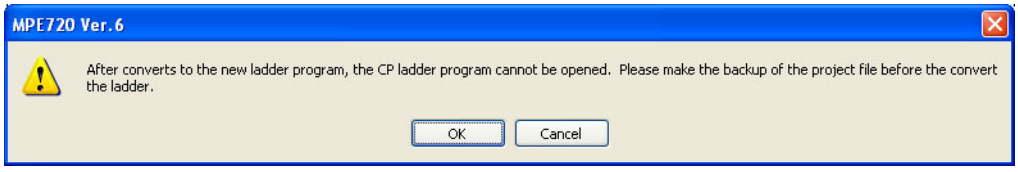


3.6 Converting CP Ladder Programs to Ordinary Ladder Programs

The ladder programs created using CP ladder language (CP ladder programs) can be converted to ordinary ladder programs. When converting a CP ladder program, DWG properties and comments in the program will be converted at the same time.
An individual program, or multiple programs, selected from the Ladder Subwindow can be converted, and the results will be output to the Output Subwindow.
The CP ladder program conversion function is enabled only when offline. (The function is disabled when a Machine Controller is connected to the MPE720 version 6 (online).)
The security setting and enable/disable ladder program setting made for the CP ladder program remain valid after the CP ladder program is converted.

- Once a CP ladder program has been converted to an ordinary ladder program, the CP ladder program cannot be opened any more.
  If the CP ladder program is needed, use either of the following methods to save the project file.
  - Copy the project file from Windows Explorer and paste
  - Select ***Edit*** - ***Save Project As*** from the main menu.

- Refer to *1.8.4 Security: User Registration* for details on security settings, and *3.4.3 (4) Enabling or Disabling Ladder Programs* for details on enabling or disabling ladder programs.
- When executing CP ladder program conversion for the first time, the following message will appear.

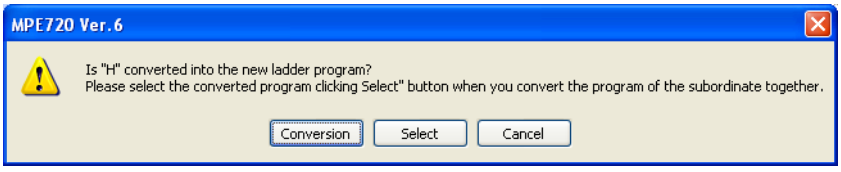

MPE720 Ver.6
After converts to the new ladder program, the CP ladder program cannot be opened. Please make the backup of the project file before the convert the ladder.
OK
Cancel

3.6.1 Converting CP Ladder Programs as a Batch

Select a program folder, such as High-speed, Low-speed, Start, Interrupt, and Function, that contains programs of the lower hierarchical levels, or a ladder program that contains CP ladder programs from the Ladder Subwindow. All the CP programs in the selected folder or program will be converted at once.

1. Select a program folder (High-speed, Low-speed, Start, Interrupt, or Function) or select a program that contains programs of the lower hierarchical levels. Then, right-click the selected folder or program and select ***Conversion of CP ladder*** from the pop-up menu.

When the selected program contains programs of lower hierarchical levels, the following message will appear asking for confirmation.

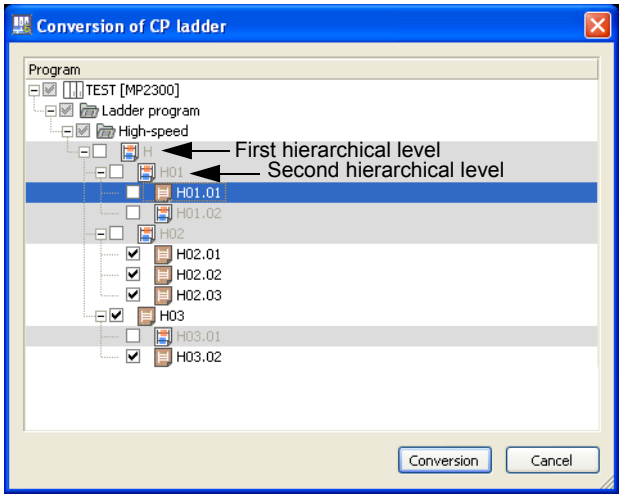

MPE720 Ver.6
Is "H" converted into the new ladder program?
Please select the converted program clicking Select" button when you convert the program of the subordinate together.
Conversion
Select
Cancel

Conversion: Click this button to convert the current program and all lower level programs to new ladder programs.
Select: Click this button to display the **Conversion of CP ladder** Dialog Box. See step 2 for details on setting.
Cancel: Click this button to cancel program conversion.

2. Click **Select**.

The **Conversion of CP ladder** Dialog Box will appear.
The check box of the CP ladder program specified in step 1 or the check boxes the CP ladder programs that are displayed under the ladder program specified in step 1 will be selected.
When a program from the second hierarchical level is specified in step 1, the check box of the programs of first hierarchical level will also be selected.

- After deselecting the check boxes of the CP ladder programs not to be converted in step 3, the check boxes of the project file, ladder program folder, High-speed, Low-speed, Start, Interrupt, or Function folder to which non-selected CP ladder programs belong will be shaded. This is because some of CP ladder programs in the file or folder are selected and the rest are not selected.



3. Clear the check boxes of CP ladder programs not to be converted.

- Ordinary Ladder programs are shaded, and cannot be selected.

4. Click ***Conversion***. All the selected CP ladder programs will be converted to new ladder programs.

If you click the **Cancel** Button, the CP ladder program conversion will be cancelled.

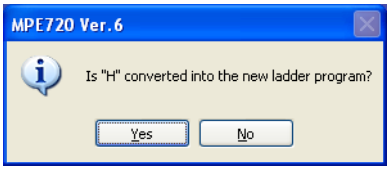
An error code (0xAxxxxxxx) and an error name may be displayed in the Output Subwindow in accordance with the changed program.
Select the error code (0xAxxxxxxx) and press the **F1** Key. ***Error Generating Information*** will appear.
Check the error causes and take corrective action.

3.6.2 Converting a Program Individually

Select a CP ladder program that does not contain programs of lower hierarchical levels, or a CP ladder program under which no hierarchical structure is displayed, from the Ladder Subwindow. The selected CP ladder program can be individually converted to a new ladder program.

1. Select a CP ladder program that does not contain programs of lower hierarchical levels, or a CP ladder program under which no hierarchical structure is displayed, from the Ladder Subwindow. Then, right-click the selected program and select ***Conversion of CP ladder*** from the pop-up menu.

   The following message will appear asking for confirmation.



   - When the selected program contains programs of lower hierarchical levels, refer to *3.6.1 Converting CP Ladder Programs as a Batch*.

2. Click **Yes**. The selected CP ladder program will be converted to an ordinary ladder program.

Chapter 4

Motion Programming

This chapter describes how to develop motion programs.

4.1 Overview ----------4-2
4.1.1 What Is a Motion Program? ---------- 4-2
4.1.2 Main Programs and Sub Programs ---------- 4-2
4.1.3 Group Definitions ---------- 4-2
4.2 Creating New Motion Programs ----------4-3
4.3 Managing Motion Programs ----------4-5
4.3.1 Saving Motion Programs ---------- 4-5
4.3.2 Editing Motion Program Files ---------- 4-6
4.3.3 Displaying Property Columns ---------- 4-7
4.3.4 Compiling Motion Programs ---------- 4-8

4.1 Overview

4.1.1 What Is a Motion Program?

A **Motion Program** is written in a structured text language called motion language. It is referenced (called) from the ladder program using the MSEE instruction.
A maximum of 256 motion programs can be created.

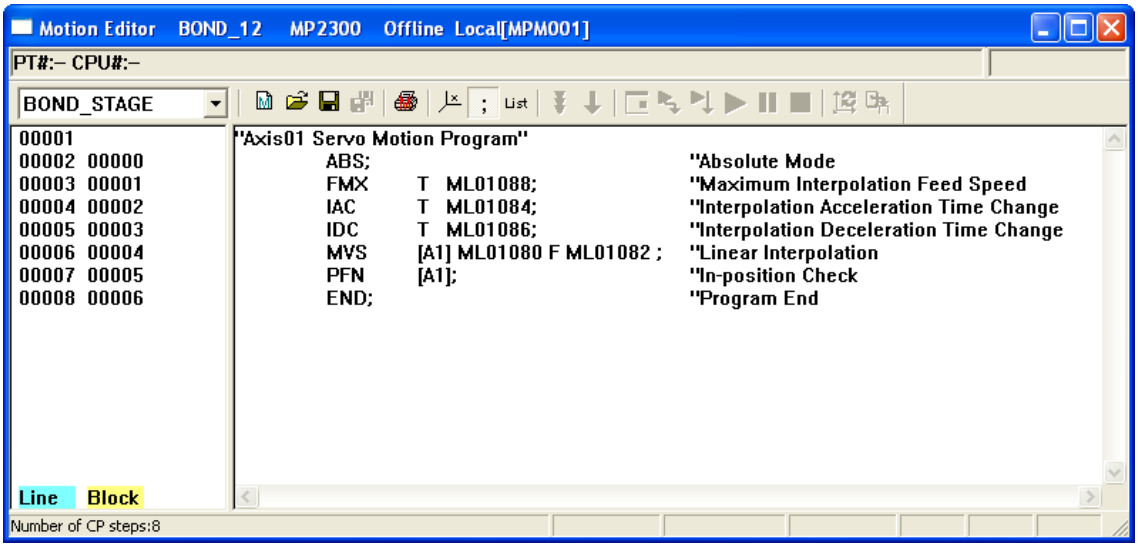

Motion Editor BOND_12 MP2300 Offline Local[MPM001]
PT#:– CPU#:–
BOND_STAGE
00001 "Axis01 Servo Motion Program"
00002 00000 ABS; "Absolute Mode
00003 00001 FMX T ML01088; "Maximum Interpolation Feed Speed
00004 00002 IAC T ML01084; "Interpolation Acceleration Time Change
00005 00003 IDC T ML01086; "Interpolation Deceleration Time Change
00006 00004 MVS [A1] ML01080 F ML01082 ; "Linear Interpolation
00007 00005 PFN [A1]; "In-position Check
00008 00006 END; "Program End
Line Block
Number of CP steps:8

Fig. 4.1 Motion Program Example

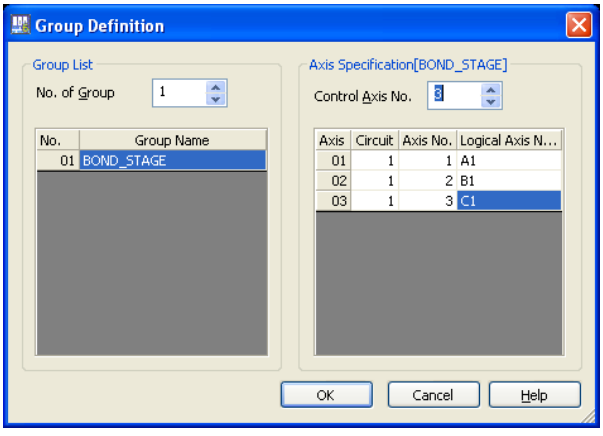
4.1.2 Main Programs and Sub Programs

Motion programs consist of main programs (MPMxxx) and sub programs (MPSxxx). Main programs are called directly from ladder programs, and sub programs are called from either main programs or other sub programs.

- The "xxx" represents a number from 1 to 256.

4.1.3 Group Definitions

With motion programs, the axes involved in operations are organized into individual groups, and programs can be created for each group. When a motion program is created, the axis group to which the program applies is specified in a dialog box.



4.2 Creating New Motion Programs

Use the procedure described below to create a new motion program.

- The Module Configuration must be defined for a new motion program to be created. Refer to *2.1 Module Configuration*, and set the Module Configuration.

1. Double-click the Motion Programs Folder in the Motion Subwindow. Alternatively, right-click the Motion Programs Folder, and then select ***Group Definition*** from the pop-up menu, or double-click the Axis Variable Folder in the Variable Subwindow.

The **Group Definition** Dialog Box will be displayed.

2. Set each item, and then click the **OK** Button.

Group List

When a number is entered in the *No. of Group* Field, the group number and name will be displayed. The group name can be changed by clicking the cell to display the text cursor and then changing the name.
When the group name is clicked, the specified axes for that group will be displayed in the *Axis Specification* Field.

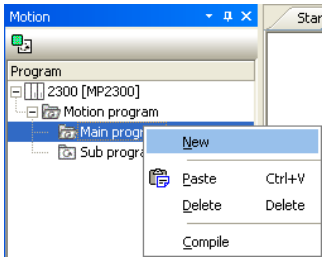
Axis Specification [Group Name]

Set the axis specifications for the selected group.
When the number of controlled axes is entered in the *Control Axis No.* Field, fields for setting that number of axes will be displayed.
For the *Logical Axis Name*, double-click the cell to display the text cursor, and then enter the name and press the **Enter** Key.

When the **OK** Button is clicked, the *Main program* and *Sub program* Folders will be displayed under the Motion Program Folder in the Motion Subwindow.

- If there are multiple groups, the folder for each group will be displayed. When a group folder is opened, the *Main program* and *Sub program* Folders will be displayed.

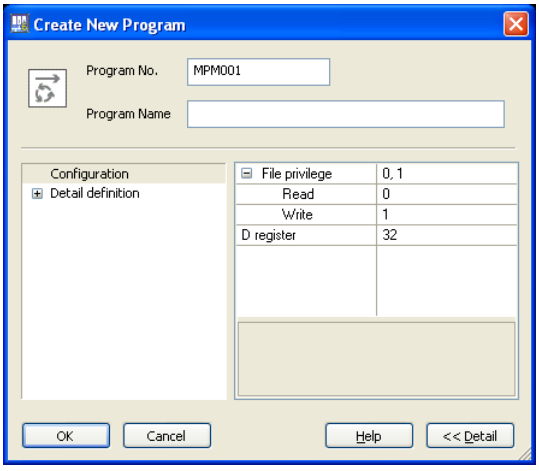
3. Right-click the *Main program* Folder or *Sub program* Folder, and then select ***New*** from the pop-up menu.



The **Create New Program** Dialog Box will be displayed.

4. Set each item in the *Configuration*, and then click the **OK** Button.

- For details on *Detail Definitions*, refer to *3.4.3 (5) Ladder Program Properties*.



Program No.

When a main program or sub program is created, MPMxxx or MPSxxx is displayed automatically. ("xxx" represents the smallest number from 1 to 256 that has not been used for a program.) The "xxx" can be changed to any number by clicking in the input field to display the text cursor and then making the change.

Program Name

Input a program name using up to 48 alphanumeric characters.

File Privileges

The read and write privilege levels will be displayed.

Read and Write

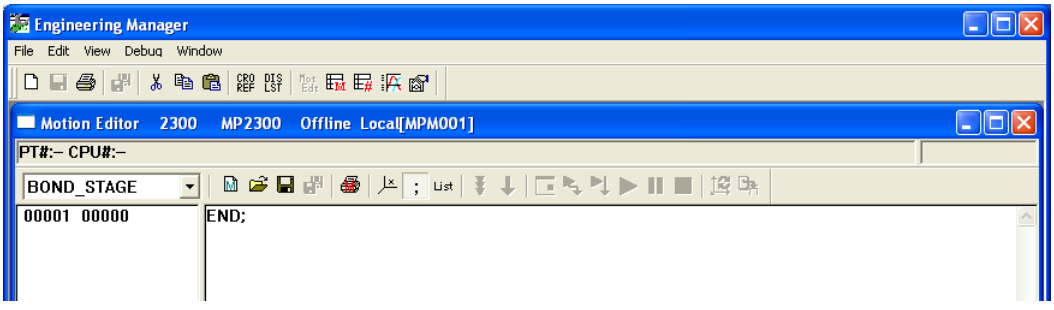
Set the read and write privilege levels to any of up to eight levels, from 0 to 7. The higher the number, the higher the privilege level will be.

- The maximum value for each privilege level reflects the privilege level of the user who is accessing the program.
- For details on file read and write privilege levels, refer to ■ *File Privilege Levels and Read/Write Privilege Levels*.

D Registers

Set the maximum number of D registers from 0 to 16,384 that can be used by this program.

When the **OK** Button is clicked, the Engineering Manager will start and the **Motion Editor** Window will be displayed. The motion program can then be edited.



- For details on motion program instructions, refer to the *Machine Controller MP900/MP2000 Series User's Manual Motion Programming* (SIEZ-C887-1.3).

■ File Privilege Levels and Read/Write Privilege Levels

Program read and write privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's read privilege level. Similarly, in order to edit a particular program, the user must have a privilege level at least as high as the program's write privilege level.

- For details on setting and checking user privilege levels, refer to *1.8.4 Security: User Registration*.

4.3 Managing Motion Programs

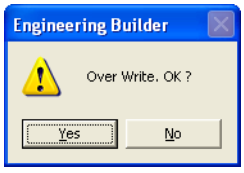
4.3.1 Saving Motion Programs

Motion programs that have been edited using the Motion Editor are saved using the Engineering Manager.

- Motion programs are also saved automatically when the project file is saved and closed.

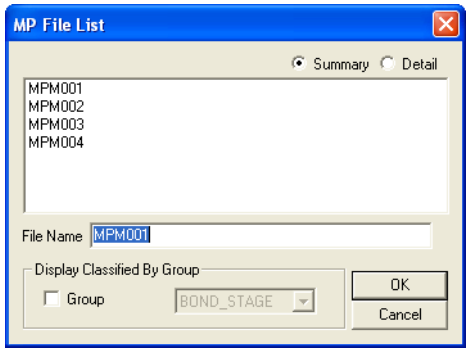
(1) Overwriting the Motion Program

Select ***File*** - ***Save***. A confirmation message will be displayed. Click the **Yes** Button to overwrite the program.



(2) Saving the Motion Program with a New Name

Select ***File*** - ***Save As***. The **MP File List** Dialog Box will be displayed. Select the **Group** Check Box to select a group folder.



Enter the file name and then click the **OK** Button.
The following confirmation message will be displayed when a file name has been entered with the same name as a file already saved and the **OK** Button has been clicked. Click the **Yes** Button to perform an overwrite operation and save the file.



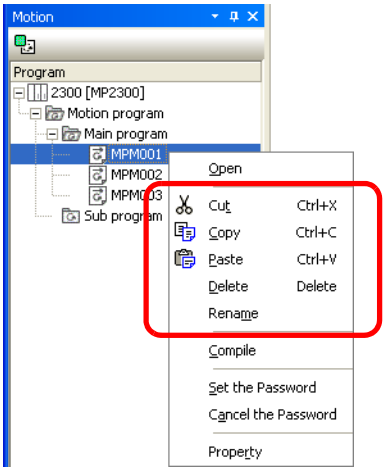
4.3.2 Editing Motion Program Files

While the Machine Controller is disconnected (i.e., while offline), motion programs can be cut, copied, pasted, deleted, or renamed in the Motion Subwindow.

- When the ***Save As*** command is used in the Engineering Manager, the operation may not be reflected in the Motion Subwindow display. Before performing operations, be sure to update the Motion Subwindow information by selecting ***Display*** - ***Update*** from the Main Menu, or by right-clicking in the Motion Subwindow and selecting ***Update***.

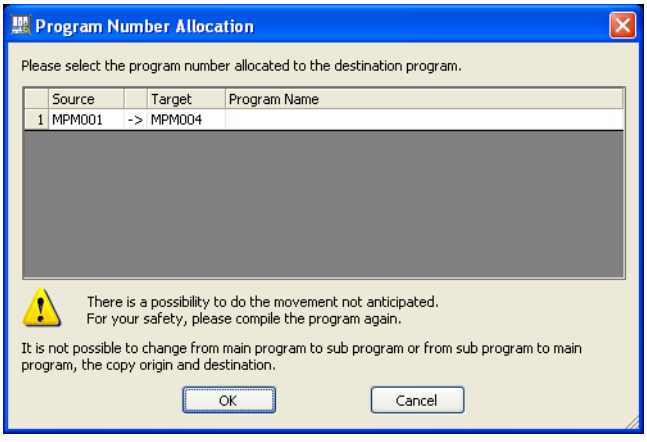
1. In the Motion Subwindow, select the motion program that is to be edited, and then select ***Edit*** - ***Cut*** (or ***Copy***, ***Paste***, or ***Delete***) from the Main Menu. Alternatively, right-click and then select ***Cut***, ***Copy***, ***Paste***, or ***Delete*** from the pop-up menu.

- Programs cannot be cut, copied, or pasted between main programs and sub programs.

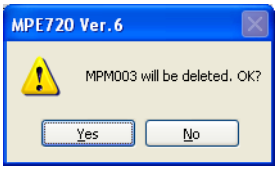


When ***Paste*** or ***Delete*** is selected, one of the following confirmation messages will be displayed. Click the **Yes** or **OK** Button to execute the operation.

When ***Paste*** Is Selected

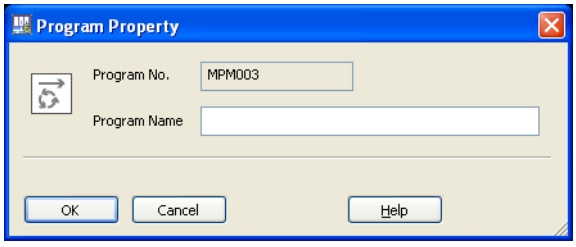

Program Number Allocation
Please select the program number allocated to the destination program.
Source
Target
Program Name
1 MPM001 -> MPM004
There is a possibility to do the movement not anticipated.
For your safety, please compile the program again.
It is not possible to change from main program to sub program or from sub program to main program, the copy origin and destination.
OK
Cancel

When ***Delete*** Is Selected



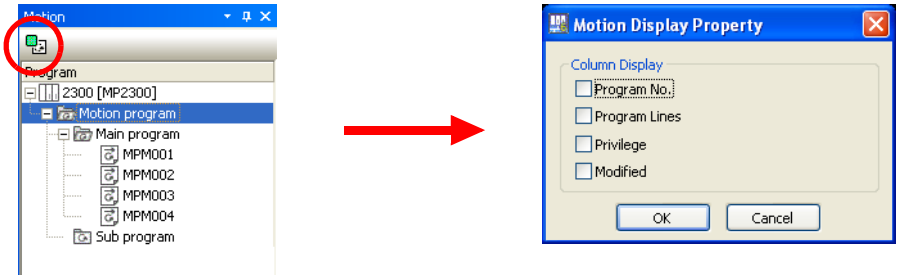
When ***Rename*** is selected, the following dialog box will be displayed. Enter the new program name and then click the ***OK*** Button.

- The program number cannot be changed.



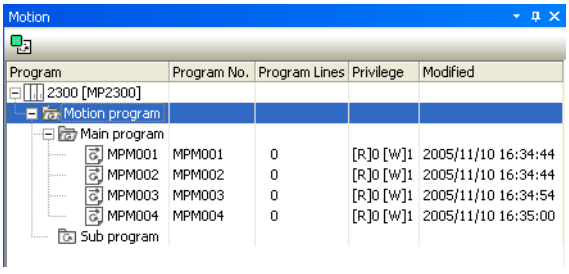
4.3.3 Displaying Property Columns

The **Motion Display Property** Dialog Box will be displayed by clicking the **Motion Program Properties** Button.



- All of the checkboxes are cleared by default.
- For details on privileges, refer to *4.2 Creating New Motion Programs*.

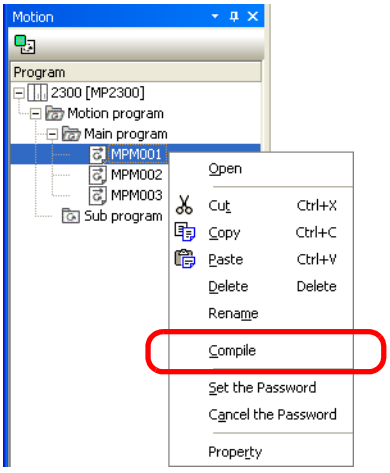
To display information in the Motion Subwindow, select the appropriate checkbox and then click the **OK** Button. A column for that information will then be displayed in the Motion Subwindow.



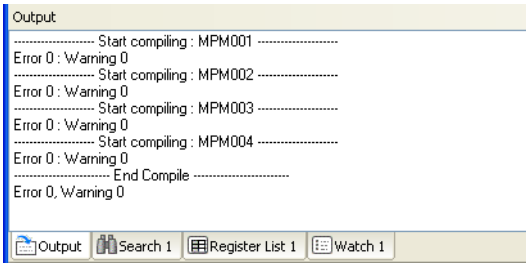
4.3.4 Compiling Motion Programs

A motion program can be compiled by first selecting the program in the Motion Subwindow, and then right-clicking and selecting ***Compile*** from the pop-up menu.

- When an individual program is selected, only that program will be compiled.
- When a folder is selected, all of the programs in that folder will be compiled.



The results of the compile operation will be output in the Output Subwindow.


Output
---------- Start compiling : MPM001 ----------
Error 0 : Warning 0
---------- Start compiling : MPM002 ----------
Error 0 : Warning 0
---------- Start compiling : MPM003 ----------
Error 0 : Warning 0
---------- Start compiling : MPM004 ----------
Error 0 : Warning 0
---------- End Compile ----------
Error 0, Warning 0
Output
Search 1
Register List 1
Watch 1

Chapter 5

Variables

This chapter describes the variables used in ladder programs.

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5.1 Overview

5.1.1 Types of Variables

Variables are used to assign names (called variable names) and comments to register addresses. When a variable is input for an instruction object in a ladder program, the register address and comment are entered at the same time.

- For details on entering variables for instruction objects, refer to *3.3.12 Entering and Changing Variables and Register Addresses*.
- MPE 720 Version 6 does not support for the #, X, Y, and Z registers.

Several types of variables can be used:

Variables that Are Automatically Assigned by System

- System Variables (S Registers)
  Prepared in the system, and displays the operation status of the controller
- Axis Variables (I/O Registers)
  Displays the setting parameters for axes, and the monitor parameters.
- I/O Variables (I/O Registers)
  Prepared according to the numbers of I/O modules.

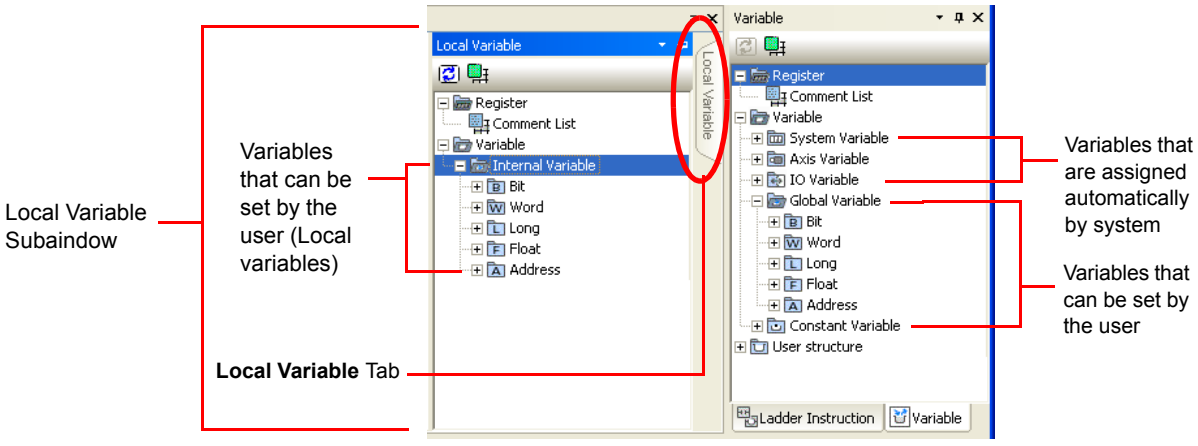
Variables that Can Be Set by the User

- Global Variables (M Registers)
- Global Constants (C Registers)
- Internal Variables (D Registers)
- Function External Variables (A Registers)

5.1.2 Displaying Variables

Variables are displayed in the Variable Subwindow and the Local Variable Subwindow as shown below.

- The Local Variable Subwindow is displayed by moving the cursor to the **Local Variable** Tab Page displayed when the ladder program is opened.

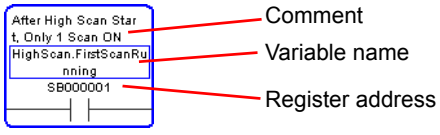


The display for each variable in the folders in the variable tree provides the following information.

<Example> Always ON: On coil (SB000004)

Comment | Variable name | Register address

When a variable is entered for an instruction object, the variable name and comment are displayed as follows:



- Register addresses are displayed when the address indicator icon on the ladder editor toolbar is ON. Refer to *3.3.4 (2) Displaying or Hiding Addresses, Variables, and Comments* for details on selecting the display for addresses, variables, and comments.

The variables are described in more detail on the following pages.

5.2 Variables that Are Automatically Assigned by System

Among the variables displayed in the Variable Subwindow, the following three types cannot be assigned by the user.

- System variables
- Axis variables
- I/O variables

The user can, however, edit logical axis names for axis variables.
They are described in more detail below.

- Note that the user cannot edit comments for system variables and axis variables.
- Note that changing the module configuration definitions or register range will automatically delete the variables. The comments will not be deleted.
- Changing the registers of already set variables will not replace the variables used in the ladder program.

- S registers (system variables) and I/O registers (axis variables and I/O variables) can be assigned for trace. However, those registers that can be assigned are limited to registers of BIT, WORD, LONG, and FLOAT type data.

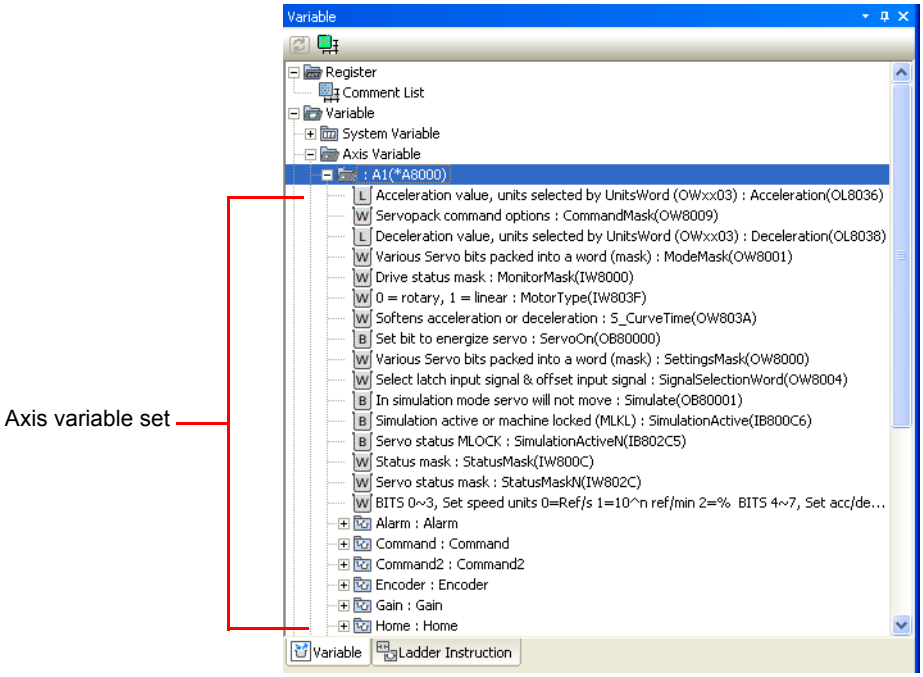
5.2.1 System Variables (S Registers)

System registers (S registers) are assigned as variables, so system variables are preset for MPE720 version 6. For a list of the system variables, refer to *A.1 Variables that are Automatically Assigned by System*.

Do not use the name that is same as the register name for the logical port.
Otherwise, axis variables can not be used, and the error message will occur.

5.2.2 Axis Variables (I/O Registers)

Axis groups with related operations can be assigned. The logical axis variable set for all assigned groups is displayed in the *Axis Variable* tree in the Variable Subwindow.


Axis variable set
Variable
Register
Comment List
Variable
System Variable
Axis Variable
: A1(*A8000)
Acceleration value, units selected by UnitsWord (OWxx03) : Acceleration(OL8036)
Servopack command options : CommandMask(OW8009)
Deceleration value, units selected by UnitsWord (OWxx03) : Deceleration(OL8038)
Various Servo bits packed into a word (mask) : ModeMask(OW8001)
Drive status mask : MonitorMask(IW8000)
0 = rotary, 1 = linear : MotorType(IW803F)
Softens acceleration or deceleration : S_CurveTime(OW803A)
Set bit to energize servo : ServoOn(OB80000)
Various Servo bits packed into a word (mask) : SettingsMask(OW8000)
Select latch input signal & offset input signal : SignalSelectionWord(OW8004)
In simulation mode servo will not move : Simulate(OB80001)
Simulation active or machine locked (MLKL) : SimulationActive(IB800C6)
Servo status MLOCK : SimulationActiveN(IB802C5)
Status mask : StatusMask(IW800C)
Servo status mask : StatusMaskN(IW802C)
BITS 0~3, Set speed units 0=Ref/s 1=10^n ref/min 2=% BITS 4~7, Set acc/de...
Alarm : Alarm
Command : Command
Command2 : Command2
Encoder : Encoder
Gain : Gain
Home : Home
Variable
Ladder Instruction

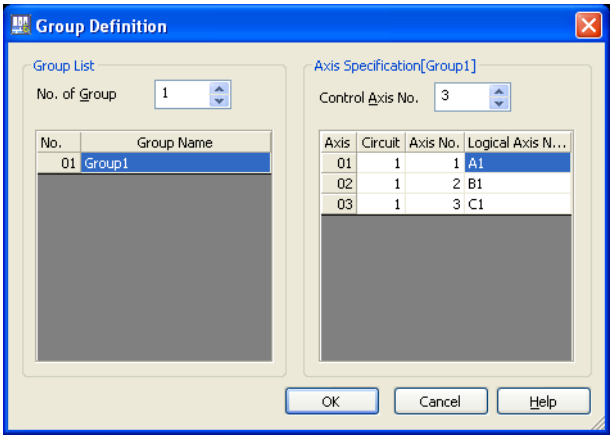
- The contents of the variable set is the same for each axis. It consists of Monitor Parameters and Setting Parameters.
- Group names and logical axis names can be set optionally, but the contents of the axis variable set cannot be changed.
- The logical axis variables set in the Group Definitions are displayed by default.
- Refer to *A.2 Axis Variable Details* for details on axis variable sets.

(1) Registering and Editing Groups and Logical Axes

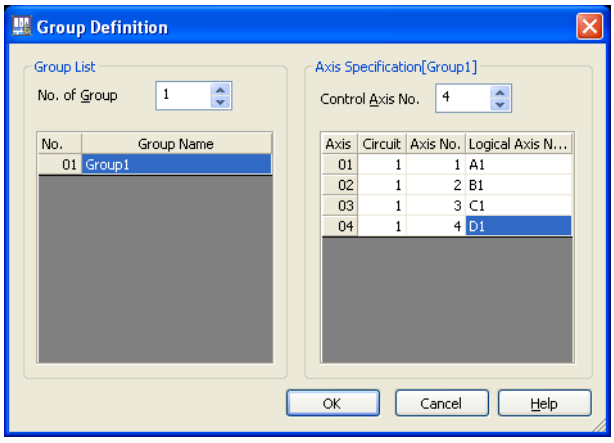
Use the following procedure to define group numbers and names, and the logical axes and names that are to be used with each group. Groups and logical axes that are already assigned can also be edited.

1. Double-click the Axis Variable Folder in the Variable Subwindow.

The **Group Definition** Dialog Box will be displayed.



2. Set the items, and then click the **OK** Button.



Group List

When a number is entered for *No. of Group*, the group number and name will be displayed. The group name can be changed by clicking the cell to display the text cursor and then changing the name.

When the group name is clicked, the specified axes for that group will be displayed in the *Axis Specification* Field.

Axis Specification [Group Name]

Set the axis specifications for the selected group.

When the number of controlled axes is entered in the *Control Axis No.* Field, the fields for setting that number of axes will be displayed.

For the *Logical Axis Name*, double-click the cell to display the text cursor. Then enter the name and press the **Enter** Key.

- In the *Logical Axis Name* Field, enter up to eight alphanumeric characters starting with a letter of the alphabet. Do not use a number for the leading character.

When the **OK** Button is clicked, the contents that have been set will be displayed under *Axis Variable* in the Variable Subwindow.

(2) Axis Variable Set Details

Refer to *A.2 Axis Variable Details for details* on axis variable sets.

5.2.3 I/O Variables (I/O Registers)

I/O variables are automatically assigned by the system for I register and O register addresses and displayed for variables of I/O points for the I/O Modules set in the Module Configuration.

- For information in setting the Module Configuration, refer to *2.1 Module Configuration*.

The following table lists the I/O register functions and the I/O Modules that support them.

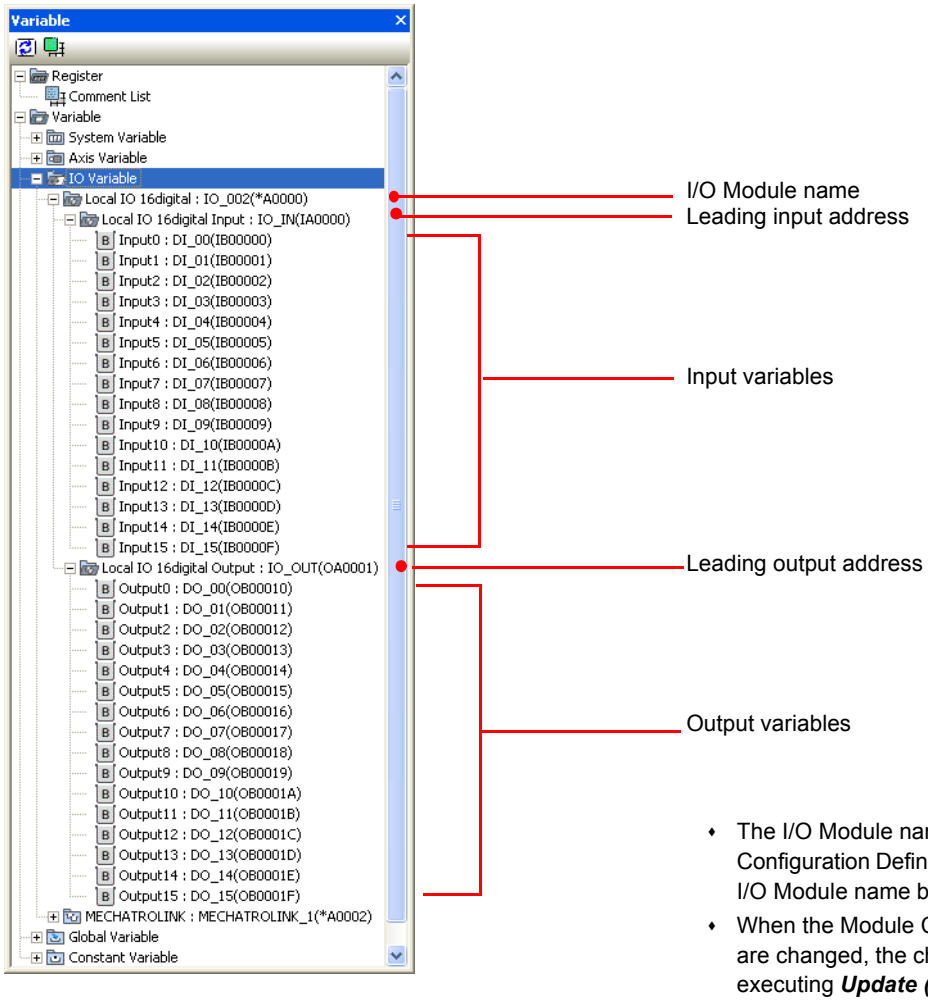
Note that executing any of the following operations will delete the set registers:

1. If the LIO Module that is assigned in the Module Configuration is saved by setting to UNDEFINE, the I/O variables that are assigned will be deleted.
2. If the register range (leading I/O register numbers and end input register number) that is assigned for the subslot in the Module Configuration Window is changed. The I/O variables that were out of the range will be deleted.

(1) I/O Variable Tables

For more information on each of the I/O variables, refer to *A.3 I/O Variables*.

The following example shows a display with 16-point local I/O variables.



- The I/O Module name shown in the Module Configuration Definitions is displayed for the I/O Module name by default.
- When the Module Configuration Definitions are changed, the changes are displayed by executing ***Update (F5)***.

Variable names and register addresses cannot be changed for I/O variables, but the following items can be edited.

I/O Module name

I/O leading address comments

I/O variable comments

The next section describes how to edit these items.

(2) I/O Modules that Can Use Variables

The following table shows the I/O Modules that can be used on MPE720 version 6.

Type	Module		Can be displayed on MPE720 Version 6
	Main Slot	Sub Slot	
CPU Modules	MP2100	CPU	NO
		IO	YES
		SVB*	YES
		BUSIF	YES
	MP2200	CPU	NO
		SVR	NO
	MP2300	CPU	NO
		IO	YES
		SVB*	YES
		SVR	NO
Option Modules	LIO-01/LIO-02	LIO	YES
		CNTR	YES
	LIO-04/LIO-05	LIO32	YES
	DO-01	DO	YES
	AI-01	AI	YES
	AO-01	AVO	YES
	CNTR-01	CNTR01	YES
	218IF-01	217IF	NO
		218IF	NO
	217IF-01	217IF	NO
	215AIF-01	217IF	NO
		MPLINK	YES
	260IF-01	217IF	NO
		260IF	YES
	261IF-01	217IF	NO
		261IFS	YES
	AFMP-01	ANYWIRE	YES
	SVA-01	SVA01	NO
	SVB-01	SVB01*	YES
	PO-01	PO	NO
	CSIF-01	CSIF	YES
	MPANL00-0	A-net	YES
		A-Link	YES
	216AIF-01	216IF	YES

* Modules that can be allocated to the MECHATROLINK.

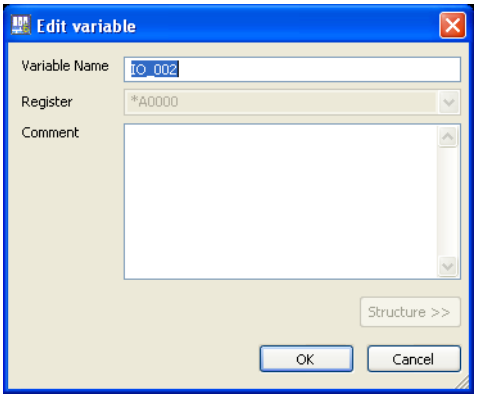
(3) Editing I/O Module Names and Comments

The following procedure can be used to edit I/O Module names and comments for I/O variables.

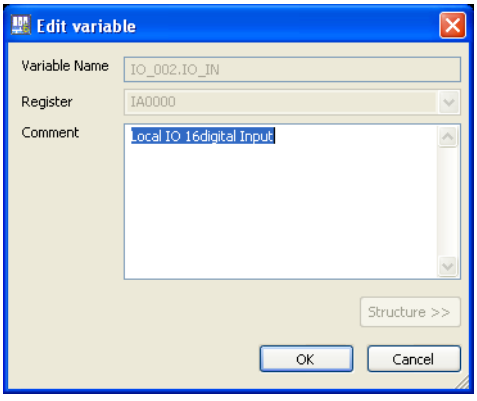
1. Right-click the I/O module name, leading I/O address, or I/O variable that is to be edited, and then select ***Edit*** from the pop-up menu that will be displayed. Alternatively, double-click the item to be edited.

The **Edit variable** Dialog Box will be displayed. When the I/O Module name is selected, data can be entered in both the *Variable Name* and *Comment* Fields. When the leading I/O address or I/O variable is selected, data can be entered in only the *Comment* Field.

2. Edit the text in the field that is to be changed, and then click the **OK** Button.



When I/O Module Is Selected



When Leading I/O Address or I/O Variable Is Selected

- Input the I/O Module name, using a maximum of 16 alphanumeric characters. Use a letter of the alphabet for the leading character.
- Carriage returns or line feeds cannot be used in the comments.

The display in the Variable Subwindow will be changed. If the selected variable is entered in the program, the comment for that variable will also be changed.

5.3 Variables that Can Be Set by the User

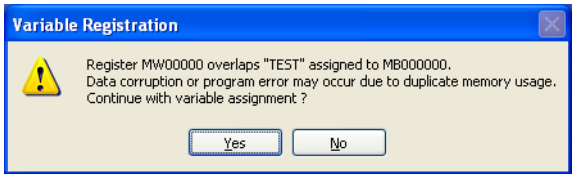
User variables can be assigned and edited by the user. There are four types of user variables:

- Global variables (M registers)
  Global variables can be referenced in any project file.
- Global Constants (C registers)
  Global Constants can be referenced in any project file.
- Internal variables (D registers)
  Internal variables are local variables that are enabled only in the ladder program where they are set.
- Function external variables (A registers)
  Function external variables are local variables that are enabled only in the function where they are set.

- M registers (global variables) and D registers (internal variables) can be assigned for trace. However, those that can be assigned for trace are limited to registers of BIT, WORD, LONG, and FLOAT type data. D registers cannot be used in motion programs.

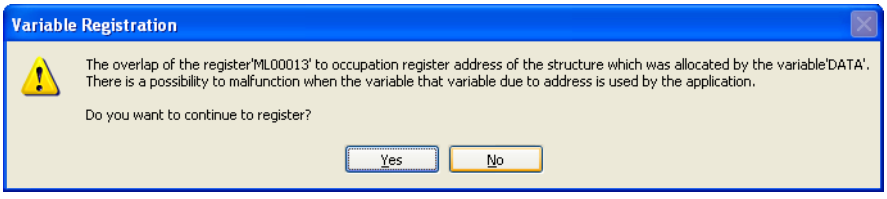
■ Precautions on Assigning Variables

- If the register already assigned to a variable is also used for a variable to be added, the following message will appear.


Variable Registration
Register MW00000 overlaps "TEST" assigned to MB000000.
Data corruption or program error may occur due to duplicate memory usage.
Continue with variable assignment ?
Yes
No

Yes: Assigns the register to the variable to be added
No: Cancels new variable assignment.

- If the register already included in a structure is also used for a variable to be added, the following message will appear.

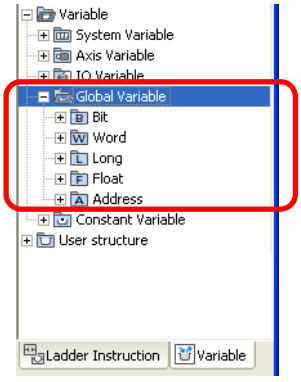

Variable Registration
The overlap of the register'ML00013' to occupation register address of the structure which was allocated by the variable'DATA'.
There is a possibility to malfunction when the variable that variable due to address is used by the application.
Do you want to continue to register?
Yes
No

Yes: Assigns the register to the variable to be added.
No: Cancels new variable assignment.

The following sections describe how to register each of these variables.

5.3.1 Variables that can be Referred from Any Program

(1) Global Variables (M Registers)



M register addresses can be assigned as variables and they are displayed in folders classified by data type in the Variable Subwindow. They can be referenced in any project file.

[a] Assigning Global Variables

Use the following procedure to assign global variables.

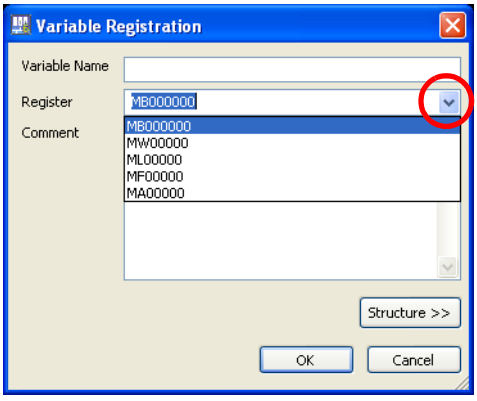
1. In the Variable Subwindow, right-click the Global Variable Folder or the folder of the data type to be registered (Bit, Word, Long, Float, or Address), and select ***Add*** from the pop-up menu.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address among the M registers for which variable assignment on is currently possible will be displayed.

2. Enter the register address in the *Register* Field.

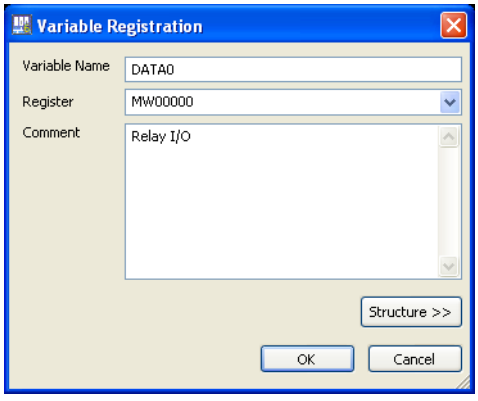
- Make the settings within the range for M registers.
  MB: 000000 to 65534F
  MW: 00000 to 65534
  ML: 00000 to 65533
  MF: 00000 to 65533
- When the **OK** Button is clicked and there is an input error in the *Register* Field, the *Register* Field will return to the state it was in before the input.
- Register addresses that are already being used cannot be entered.

Click the **Structure** Button. A list of data structures will be displayed. By giving a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



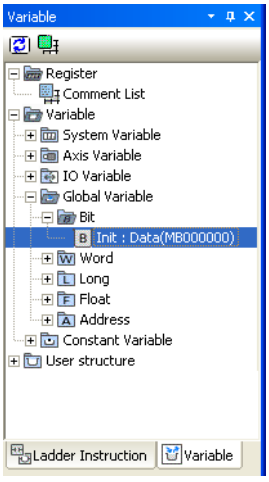
- For details on structures, refer to *5.3.1(1) [b] Creating System Structures* on the next page.

3. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.



- In the *Variable Name* Field, enter up to 64 alphanumeric characters starting with a letter of the alphabet. An error will occur if the leading character in the name is a number.
- An error will occur if a name identical to a register, such as MB (mb0) or IW00000 (iw00000), is used at the beginning of the variable.
- A variable name that is already assigned cannot be used again.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- The same address can be assigned for different data types (e.g., MB00000 and MW00000). When the address is assigned, however, a message will be displayed notifying that "A malfunction may occur."
- A maximum of 255 alphanumeric characters can be entered in the *Comment Field*.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Variable Subwindow.

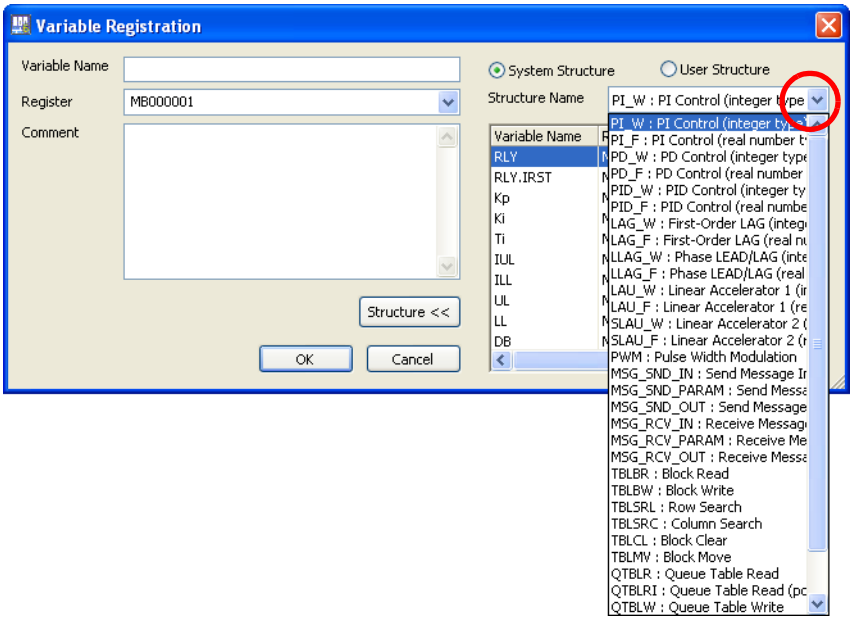


In the program where the assigned variable is used, the assigned variable name will be displayed for the instruction object of the applicable address.

[b] Creating System Structures

A system structure is a set of variables prepared in advance with an address format for a ladder instruction. Click the **Structure** Button in the **Variable Registration** Dialog Box to create a structure.
Use the following procedure to create a system structure in the **Variable Registration** Dialog Box.

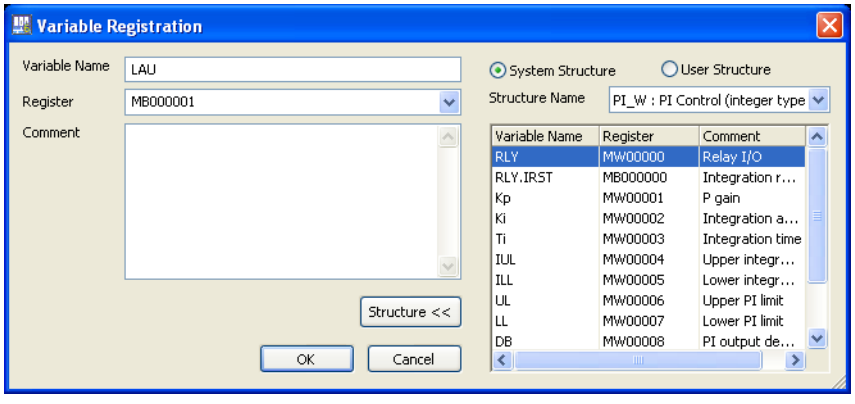
1. Select the structure from the list in the *System Structure Name* Field.



The variables included in that system structure will be displayed in a list.

- For details on the variables in each system structure, refer to *5.3.1 [c] Editing I/O Module Names and Comments*.

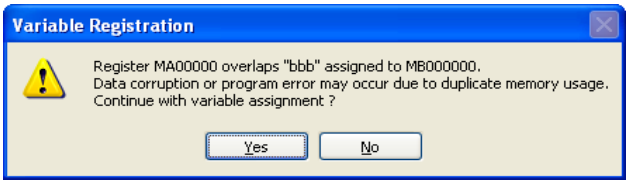
2. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, specify the address type (MA*****) in the *Register* Field, and click the **OK** Button.



- In the *Variable Name* Field, enter up to 64 alphanumeric characters starting with a letter of the alphabet. An error will occur if the leading character in the name is a number.
- An error will occur if a name identical to a register, such as MB0 (mb0) or IW00000 (iw00000), is used.
- A variable name that is already assigned cannot be used again.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- An address that is already used for another data type cannot be assigned again.
- A maximum of 255 alphanumeric characters can be input in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

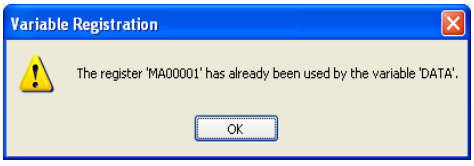
■ If a register with the same address already exists

If a register with the same address already exists in one project file, the following message will appear asking for confirmation.

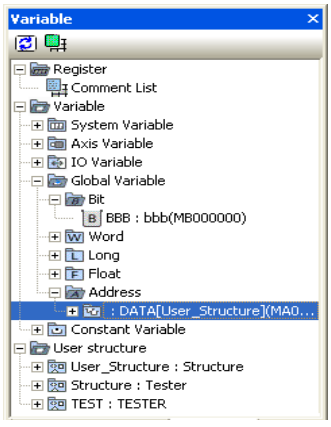

Variable Registration
Register MA00000 overlaps "bbb" assigned to MB000000.
Data corruption or program error may occur due to duplicate memory usage.
Continue with variable assignment ?
Yes
No

■ If a register with the same address type already exists

If a register with the same address type already exists in one project file, the following message will appear asking for confirmation. Change the register because the same register cannot be assigned in one project file.

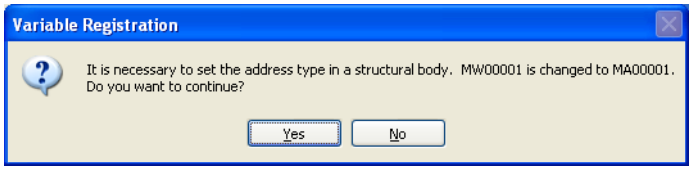


3. Enter the variable name in the Variable column and the comment in the Comment column. Specify the address type (MA*****) in the Register column, and then click **OK**.
The variable included in the assigned user structures will appear in the Variable Subwindow.



The variables included in the assigned system structure will be displayed in the Variable Subwindow.

- If the data type in the register is not the ADDRESS type, the following message will be displayed. Click the **Yes** Button to complete the assignment.


Variable Registration
It is necessary to set the address type in a structural body. MW00001 is changed to MA00001.
Do you want to continue?
Yes
No

[c] Table of System Structures

Refer to *A.4 System Structures* for details on variables included in each system structure.

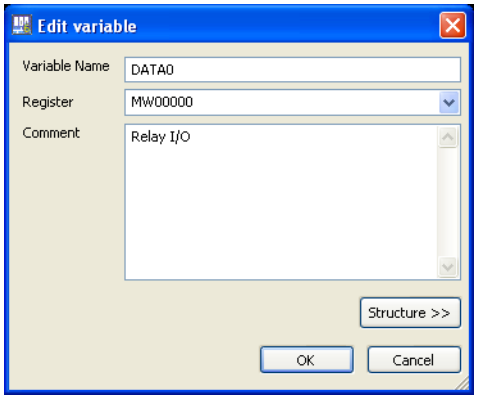
[d] Editing Global Variables

Variable names, register addresses, and comments can be edited.

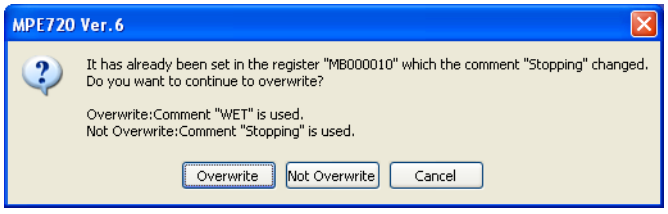
1. In the Variable Subwindow, right-click the global variable to be edited and select ***Edit*** from the pop-up menu. Alternatively, double-click the global variable to be edited.

The **Edit variable** Dialog Box will be displayed.

2. Just as with assigning variables, edit the variable name, the register address, and the comment, and click the **OK** Button.



If there is a comment already on the register to be edited, a message will appear asking for confirmation to overwrite the comment.


MPE720 Ver.6
It has already been set in the register "MB000010" which the comment "Stopping" changed.
Do you want to continue to overwrite?
Overwrite:Comment "WET" is used.
Not Overwrite:Comment "Stopping" is used.
Overwrite
Not Overwrite
Cancel

Overwrite: Overwrites the comment with the comment of the edited register.
Not Overwrite: The comment will not be overwritten and the previous comment will remain unchanged.
Cancel: Cancels the comment editing operation and closes the dialog box.

- If there is a comment on the register before being edited, and no unmatched comment on the edited register, the previous comment will remain unchanged.

- For global variables (M, I, O, and C), comments are saved in two different files: One for BIT type data and one for other data types (WORD, LONG, FLOAT, and ADDRESS).
- For local registers (D, #, X, Y, Z, and A), comments are saved in a file for each program regardless of data type (BIT, WORD, LONG, FLOAT, and ADDRESS).
- Before transferring data (Write into Controller or Read from Controller), the data in the reading source and in the saving destination must be matched so that the data in the Machine Controller will not be lost.

[e] Deleting Global Variables

Variables can be deleted. In a program where a deleted variable is used, the variable will be replaced with the register address the next time it is displayed.

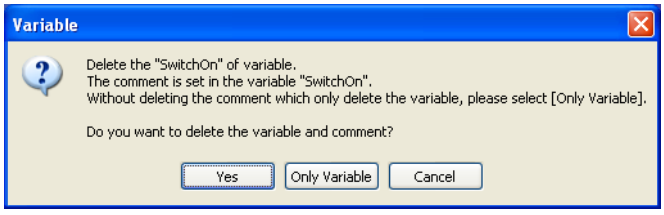
1. In the Variable Subwindow, select the variable to be deleted and press the **Delete** Key. Alternatively, right-click the variable to be deleted and select *Delete* from the pop-up menu that appears.

A dialog box will be displayed for confirmation that "The variable is to be deleted. Yes or No?"

2. Click the **Yes** Button. The selected variable will be deleted from the Variable Subwindow.

Another dialog box will appear asking whether or not to delete the comment along with the variable.

- This dialog box will appear if a comment is set for the variable.


Variable
Delete the "SwitchOn" of variable.
The comment is set in the variable "SwitchOn".
Without deleting the comment which only delete the variable, please select [Only Variable].
Do you want to delete the variable and comment?
Yes
Only Variable
Cancel

Yes: Deletes the variable and the comment.
Only Variable: Deletes only the variable.
Cancel: Cancels the deleting operation and closes the dialog box.

(2) Global Constants (C Registers)

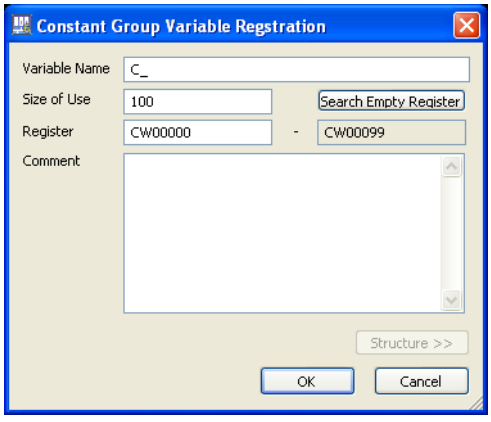
After ranges of C registers are assigned as a group, the C registers in that range can be named, and constant values (WORD, LONG, FLOAT), their units (pulse, mm, deg, inch, µm), and comments can be set.

[a] Assigning Global Constant Groups

Use the following procedure to assign the variable groups first.

1. In the Variable Subwindow, right-click the Constant Variable Folder and select ***Add*** from the pop-up menu that will be displayed.

The **Constant Group Variable Registration** Dialog Box will be displayed.



2. Set the following items as described.

Variable Name

Enter the group name with up to eight alphanumeric characters. "C_" will be automatically displayed at the beginning of the variable name.

- Enter a letter of the alphabet for the leading character of the variable name. An error will occur if a number is entered first.

Size of Use

Enter, the number of Words to be used beginning from the leading address set in the *Register* Field.
Click the **Search Empty Register** Button. Available registers of the size to be used will be found, and the leading address will be automatically entered in the *Register* Field.

Register

Enter, in WORD type, the leading address of the C register group to be assigned.

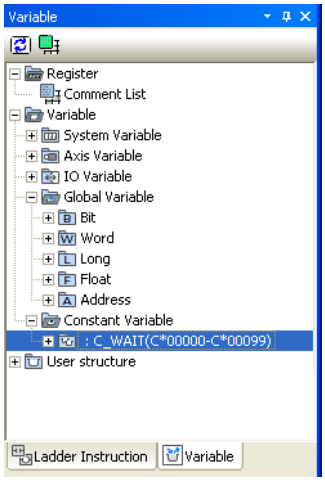
Comment

Enter a comment for this group. A maximum of 255 alphanumeric characters can be entered.

- Carriage returns and line feeds cannot be used.

3. Click **OK**.

The global constant group will be created, and it will be displayed under the Constant Variable Folder.



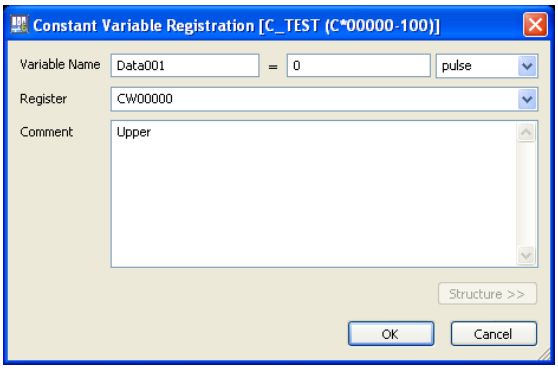
[b] Assigning Global Constants

Use the following procedure to assign a constant variable to a group.

1. In the Variable Subwindow, right-click the global constant group to which the variable is to be assigned and select *Add* from the pop-up menu.

The **Constant Variable Registration** Dialog Box will be displayed.

2. Set the following items as described.



Variable Name, Number, Unit

Enter the variable name to be given to the C registers being assigned and the value to be stored in that register.
Enter the variable name with up to 64 alphanumeric characters.
Click the drop-down arrow to display a list of units from which to select.
The number can be set within the following ranges, depending on the register data type.

WORD values: -32,768 to 32,767
LONG values: -2,147,483,648 to 2,147,483,647
FLOAT values: ± (1.175e-38 to 3.402e+38), 0

- Enter a letter of the alphabet for the leading character of the variable name. An error will occur if a number is entered first.
- An error will occur if a name identical to a register, such as MB0 (mb0) or IW00000 (iw00000), is used at the beginning of the variable.
- Variable names that have already been assigned cannot be used again in the same group.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- An address that is already used for another data type cannot be assigned again.

Register

Enter the address of the C register for which the name is to be assigned. Click the drop-down arrow and select the data type from the list. Cxnnnn will be input. (x: W, L, or F; nnnn: the lowest number used for the selected data type within the address range of the group)

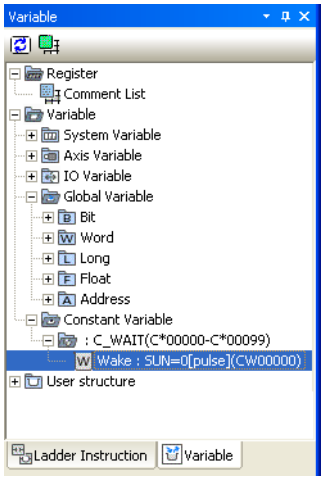
Comment

A maximum of 255 alphanumeric characters can be entered for the comment for this variable.

- Carriage returns and line feeds cannot be used.

3. Click the **OK** Button.

The name will be assigned and displayed under the selected group.



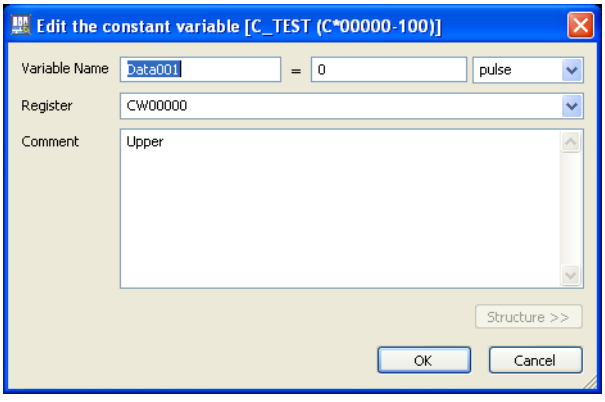
[c] Editing Global Constants

Variable names, registers, and comments can be edited. The size can also be edited.

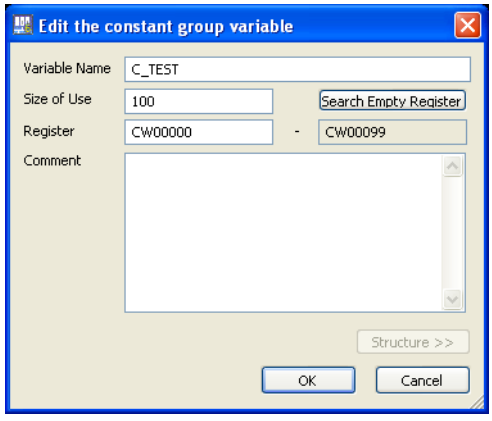
1. In the Variable Subwindow, right-click the global constant folder or global constant group to be edited and select ***Edit*** from the pop-up menu that will appear. Alternatively, double-click the global constants or global constant group to be edited.

   The **Edit constant** Dialog Box will appear.

2. Just as with assigning global constants, edit the variable name, register, or the comment, and click the **OK** Button.



When Global Constants are Selected



When Global Constant Group are Selected

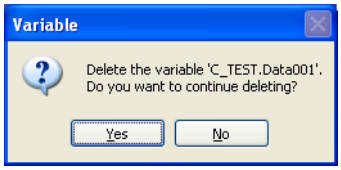
- If the user attempts to assign a register out of the possible range when the *Register* Field is being edited, a message will be displayed notifying that "The out-of-range constants are to be deleted. Yes or No?" Click the **Yes** Button. The constants that are out of range will be deleted.

[d] Deleting Global Constants or Global Constant Groups

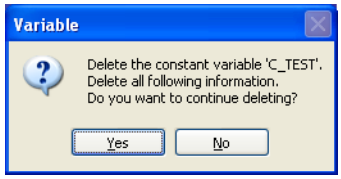
Global constants can be deleted. In a program where a deleted constant is used, the constant will be replaced with the register when it is displayed.
When global constant groups are deleted, all of the constants included in that group will be deleted.

1. In the Variable Subwindow, select the global constants to be deleted and press the **Delete** Key. Alternatively, right-click the global constants to be deleted and select *Delete* from the pop-up menu that will be displayed.

   A dialog box asking for confirmation will be displayed.



When Global Constants are Being Deleted

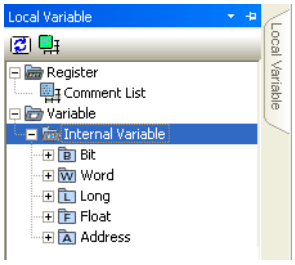


When Global Constant Group are Being Deleted

2. Click the **Yes** Button. The selected global constants or global constant group will be deleted from the Variable Subwindow.

5.3.2 Local Variables for Use in One Variable

D registers and A registers have different contents for each ladder program. For function programs, however, D registers can be assigned as internal variables, and A registers can be assigned as function external variables. For other programs, D registers can be assigned as internal variables. These variables are local variables and are valid only in the programs in which they are assigned. They are displayed in the Local Variable Subwindow.



The following sections describe how to assign and edit internal variables and function external variables.

(1) Internal Variables (D Registers)

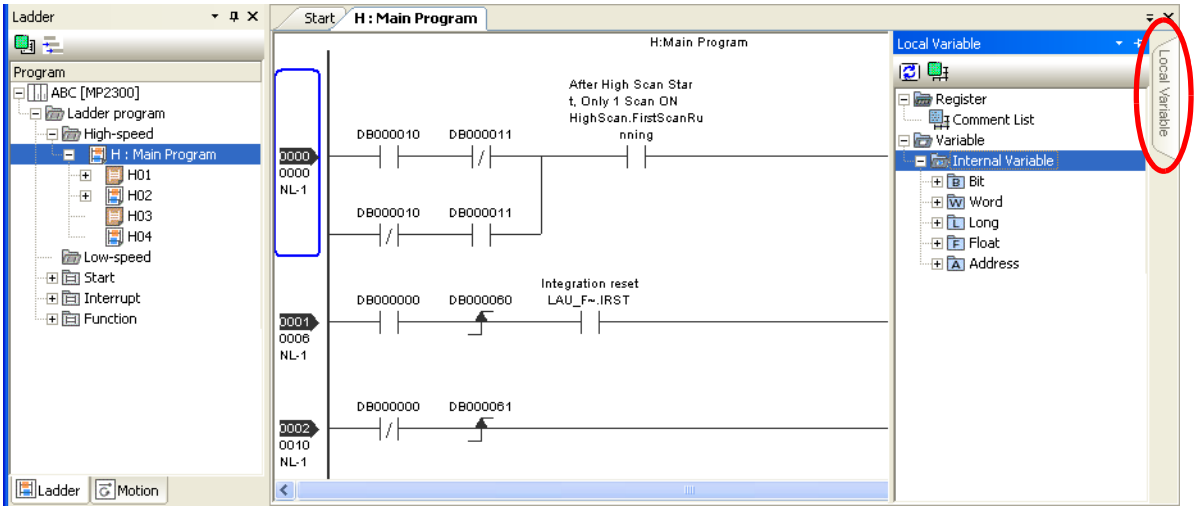
D registers can be assigned as variables for individual programs. An assigned variable is valid only for the program for which it is assigned.

[a] Assigning Internal Variables

Use the following procedure to assign internal variables.

- If needed, more addresses than those set for use in the Configuration Definition screen of the **Program Property** Dialog Box can be assigned (refer to *3.2.1 Creating New Ladder Programs*). If so, increase the number of addresses to be used to the same number as the variable to be used in the **Program Property** Dialog Box before using variables in a ladder program.
- For the procedure to set Module Configuration Definitions, refer to *2.1 Module Configuration*.

1. Open the relevant ladder program and display in the foreground of the Main Window. Line up the mouse cursor with the **Local Variable** Tab Page to display the Local Variable Subwindow.

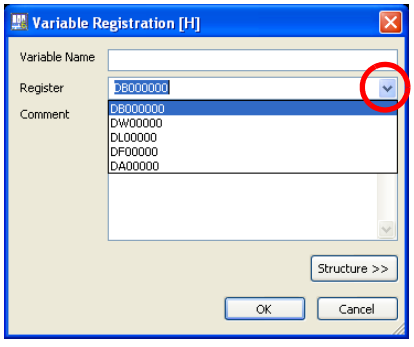


2. Right-click the Internal Variable Folder, and select ***Add***.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address used for each data type among the D registers for which variables can currently be assigned will be displayed.

3. Input the register address in the *Register* Field.

Click the **Structure** Button. A list of structures will be displayed. By giving a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



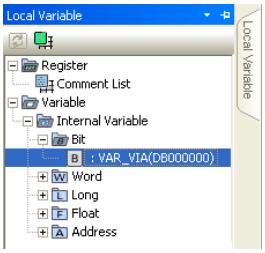
- For details on system structures, refer to *5.3.1(1) [b] Creating System Structures*.

4. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.

- In the *Variable Name* Field, enter up to 60 alphanumeric characters (or up to 64 characters if the name begins with VAR_).
- An error will occur if a name identical to a register, such as DB0 (db0) or IW00000 (iw00000), is used.
- Variable names that have already been assigned cannot be used again in the same program.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- The same address can be assigned for different data types (e.g., DB00000 and DW00000). When the address is assigned, however, a message will be displayed notifying that "A malfunction may occur."
- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Local Variable Subwindow.

- VAR_ will be displayed at the beginning of the variable name to indicate that it is a local variable.



In the program where the assigned variable is used, the assigned variable name will be displayed for the instruction object of the applicable address.

[b] Editing and Deleting Internal Variables

The following procedure can be used to edit or delete an internal variable.

1. Open the relevant ladder program and display it in the foreground of the Main Window.

2. In the Local Variable Subwindow, right-click the variable to be edited (or deleted) and select ***Edit*** (or ***Delete***) from the pop-up menu that will be displayed.

Edit: The **Edit Variable** Dialog Box will be displayed.

Delete: A dialog box asking for confirmation will be displayed. Click the **Yes** Button to delete the variable.

- Variables can also be edited by double-clicking in the Local Variable Subwindow.
- Variables can also be deleted by selecting a variable in the Local Variable Subwindow and then pressing the **Delete** Key.

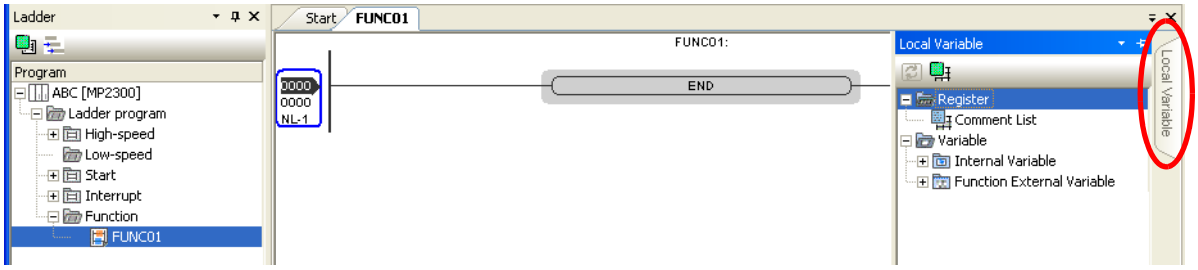
(2) Function External Variables (A Registers)

"A" registers can be assigned as variables for individual function programs. A function external variable is valid only for the function program for which it is registered. "A" registers use memory that is specified using the address reference input to the function. The programmer should take care not to overlap the memory usage (processing).

[a] Assigning Function External Variables

Use the following procedure to assign function external variables.

1. Open the relevant function and display in the foreground of the Main Window. Line up the mouse cursor with the **Local Variable** Tab Page to display the Local Variable Subwindow.



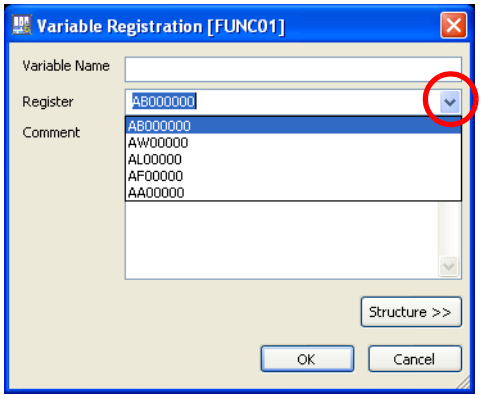
2. Right-click the Function External Variable Folder, and select ***Add***.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address used for each data type among the A registers for which variables can be assigned will be displayed.

- The **Variable Registration** Dialog Box can be displayed even if the character string for the variable to be registered has been entered and confirmed in the *Variable Name* Field for the user object in the Main Window.

3. Enter the register address in the *Register* Field.

Click the **Structure** Button. A list of structures will be displayed. By giving a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



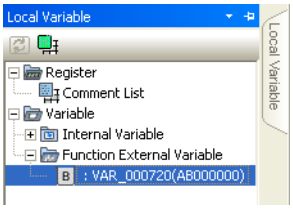
- For details on system structures, refer to *5.3.1(1) [b] Creating System Structures*.

4. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.

- Enter up to 60 alphanumeric characters in the *Variable Name* Field.
- Variable names that have already been assigned cannot be used again in the same program.
- The same address can be assigned for different data types (e.g., AB00000 and AW00000). When the address is assigned, however, a message will be displayed notifying that "A malfunction may occur."
- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Local Variable Subwindow.

- VAR_ will be displayed at the beginning of the variable name to indicate that it is a local variable.



In programs where the assigned variable is used, the assigned variable name will be displayed for the instruction object for the applicable register.

[b] Editing and Deleting Function External Variables

The following procedure can be used to edit or delete a function variable.

1. Open the relevant function program and display it in the foreground of the Main Window.

2. In the Local Variable Subwindow, right-click the variable to be edited (or deleted) and select ***Edit*** (or ***Delete***) from the pop-up menu that will be displayed.

   Edit: The **Edit Variable** Dialog Box will be displayed. The same procedure can be used for editing as is used for assignment.

   Delete: A dialog box asking for confirmation will be displayed. Click the **Yes** Button to delete the variable.

- Variables can also be edited by double-clicking in the Local Variable Subwindow.
- Variables can also be deleted by selecting a variable in the Local Variable Subwindow and then pressing the **Delete** Key.

5.4 Using Variables and Comments

5.4.1 Using Variables

Variables can be entered for use in instruction objects and subwindows. Variables can be used in the following operations. For details on entering variables, refer to the following items.

- Entering ladder objects → *3.3.12 Entering and Changing Variables and Register Addresses*
- Entering in the **Search** Dialog Box → *3.5.2 (1) Searching*
- Entering in the **Replace** Dialog Box → *3.5.2 (2) Replacing*
- Entering in the **Search in Project** Dialog Box → *3.5.3 Searching and Replacing within Projects - (1) Searching in Projects*
- Entering in the **Replace in Project** Dialog Box → *3.5.3 Searching and Replacing within Projects - (2) Replacing in Projects*
- Entering in the Cross-reference Subwindow → *3.5.4 Cross Reference Searching*
- Entering in the Watch Subwindow → *6.2.2 Watch Function*

5.5 Using Comments

5.5.1 Saving Comments

The comments that were edited on MPE720 version 6 can be saved by selecting ***File - Save*** from the main menu. The comments set for variables can also be saved in the same way.
The following table shows the destination where the comments can be read and written, online or offline for each resister.

- When online by project link connection, if the registers saved in the project file from which data is to be read are unmatched with those saved in the project file and Machine Controller to which data is to be written, the data in the writing destination may be overwritten by the read data and some data may be deleted.

Connection Status	Register	Comments to be Read From...	Comments to be Written Into...
Offline	S/Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Project file	Project file
	C	Project file	Project file
	D, #, X, Y, Z, A	Each program of a project file	Each program of a project file
Project Link Connection (Online)	S/Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Project file	Project file and Machine Controller
	C	Machine Controller	Machine Controller
	D, #, X, Y, Z, A	Each program of a Machine Controller	Each program of a Machine Controller
Direct Connection (Online)	S/ Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Machine Controller	Machine Controller
	C	Machine Controller	Machine Controller
	D, #, X, Y, Z, A	Each program of a Machine Controller	Each program of a Machine Controller

5.5.2 Linking with CP Ladder Programs

As comments on CP ladder programs are linked with those on MPE720 version 6, it is possible to display the CP ladder program comments on MPE720 version 6 or vice-versa.

- Symbols used in MPE720 version 5 are different from Comments used in MPE720 version 6. The comments that can be displayed and edited on the Comment bar or Comment list of MPE720 version 5 correspond to the comments used in MPE720 version 6.

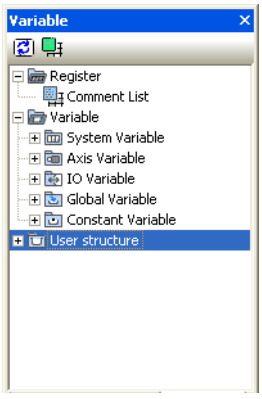
- During direct connection, if a comment of the S register is edited in the comment bar or comment list of the Engineering Manager, the comment will be invalid and not saved.

5.6 User Structures

5.6.1 What is User Structure?

A user structure is used to manage a set of variables, registers, and comments that are entered by the user.
The registers assigned to a user structure can easily be viewed on screen.

Registers assigned to a user structure are called “Structure Members”, and up to 100 structure members can be assigned to one user structure.
User structures are used by assigning them to ADDRESS type global or local variables.



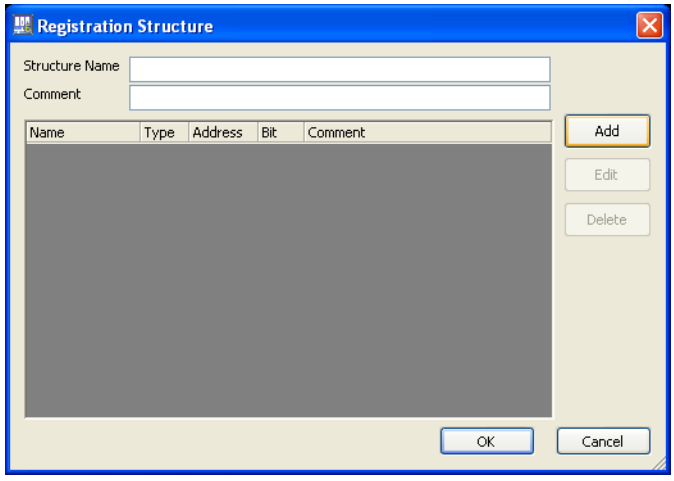
5.6.2 Creating User Structures

A user structure can be created by assigning specified variables, registers, comments, etc. in the **Registration Structure** Dialog Box.
Use the following procedure to create a user structure.

1. Right-click the ***User structure*** Folder in the Variable Subwindow and select ***Add*** from the pop-up menu.

The **Registration Structure** Dialog Box will be displayed.

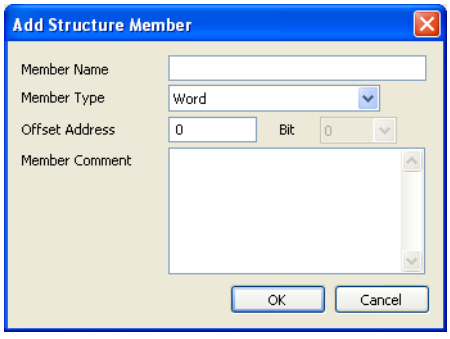
2. Enter a structure name in the ***Structure Name*** Field, and comments in the ***Comment*** Field. Then, click **Add**.



The **Add Structure Member** Dialog Box will appear.

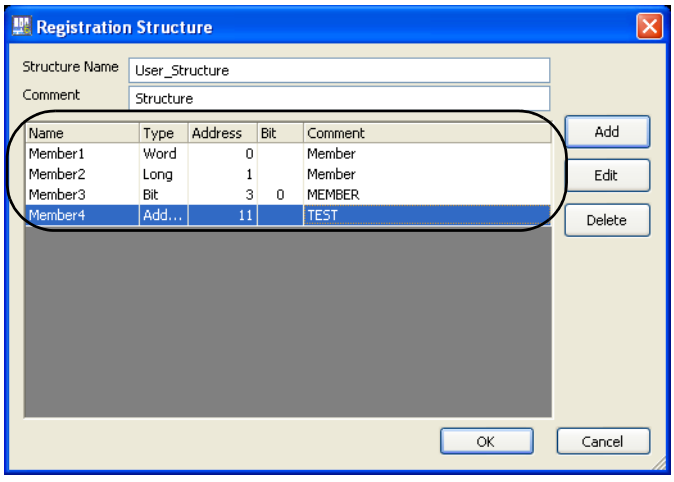
3. Enter a member name in the ***Member Name*** Field, an offset address in the ***Offset Address*** Field, and comments in the ***Member Comment*** Field. Then, click **OK**.

Click the ▼ Button in the ***Member Type*** Field to open the list and select the data type ***BIT***, ***WORD***, ***LONG***, ***FLOAT***, or ***ADDRESS***.



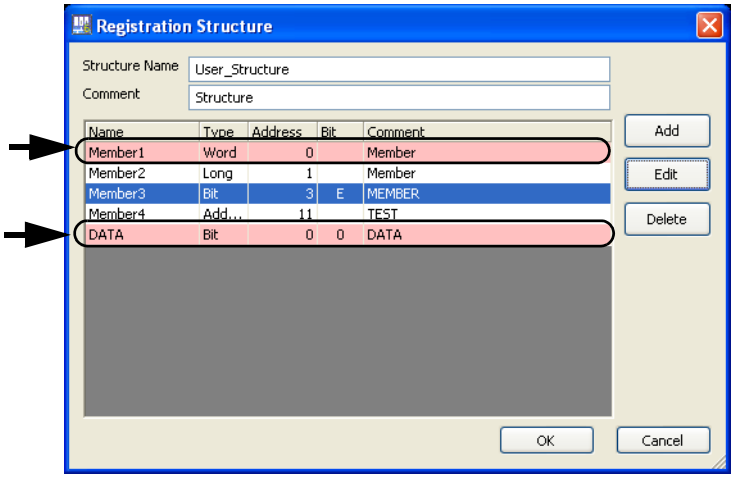
- In the ***Structure Name*** Field, enter up to 64 characters starting with an alphabetic letter. An error will occur if a name starting with a number is entered.
- An error will occur if a register name such as MB0 (mb0) and IW00000 (iw00000) is used for a structure name.
- A unique name must be used for each structure. A structure name that is already registered cannot be used more than once. (Nor can the system structure names provided by MPE720 version 6 be used.)
- Reserved words, such as motion instructions, cannot be used for structure names. Refer to *Appendix B Reserved Words* for details on the reserved words.
- A maximum of 255 alphanumeric characters can be entered in the ***Comment*** Field.
- Carriage returns and line feeds cannot be used when entering comments.

The ***Registration Structure*** Dialog Box will appear.
The assigned structure members will be displayed in a list.

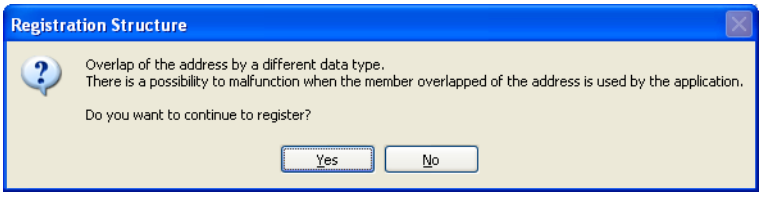


■ When Values in Address or Bit Column Overlap in a Structure Member List

When values in ***Address*** and/or ***Bit*** Column overlap in one user structure, the lines of overlapping structure members will be displayed in pink as shown below.
In the example below, the data types (BIT, WORD, LONG, FLOAT) are not overlapping.



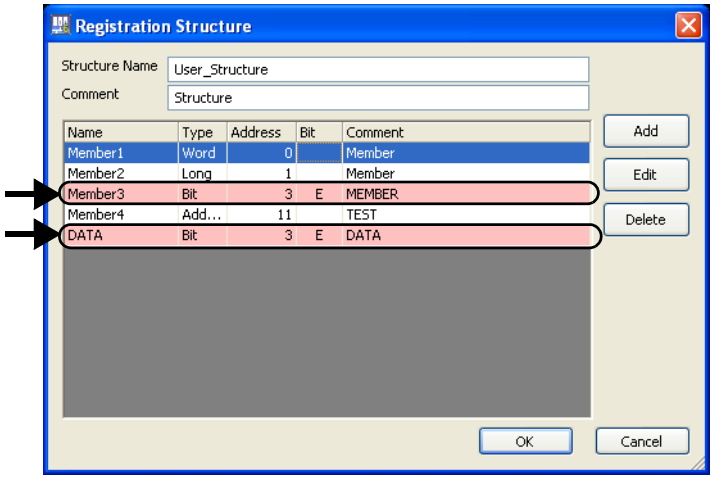
If you click **OK**, the following message will appear asking for confirmation.


Registration Structure
Overlap of the address by a different data type.
There is a possibility to malfunction when the member overlapped of the address is used by the application.
Do you want to continue to register?
Yes
No

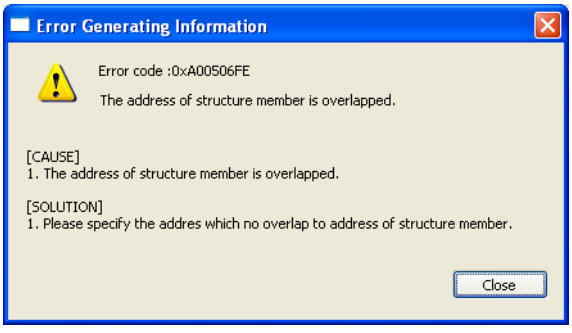
Click **Yes** to register the newly created structure.

■ When One Register is Assigned to Different Structure Members

When the data type (Type), address (Address), and bit (Bit) of one structure member overlaps with those of another member, the lines of the overlapped structure members are displayed in pink as follows.

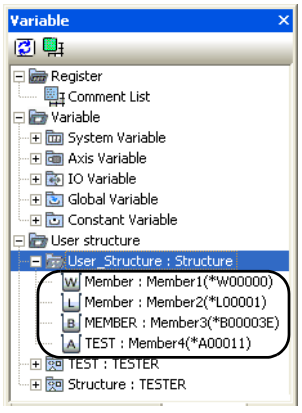


If you click **OK**, the following error message will appear. Change either of the overlapped registers, as one register can only be assigned once in one user structure.

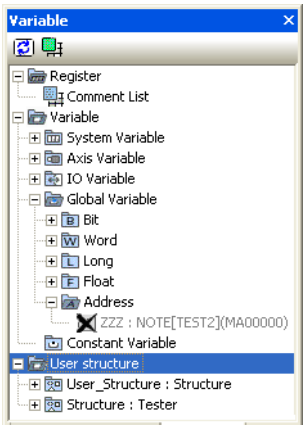

Error Generating Information
Error code :0xA00506FE
The address of structure member is overlapped.
[CAUSE]
1. The address of structure member is overlapped.
[SOLUTION]
1. Please specify the addres which no overlap to address of structure member.
Close

4. Click **OK** in the **Registration Structure** Dialog Box.

The **Registration Structure** Dialog Box will close. The new user structure is displayed in the Variable Subwindow.



- If a user structure has already been assigned to the variable, the user structure will not be deleted and its name will remain unchanged. However, the display will be deactivated.



- When a structure member of the user structure that has already been assigned to a variable is deleted in the **Registration Structure** Dialog Box, the structure member will also be deleted from the tree structure under the variable in the Variable Subwindow.
- When the name of a structure member is changed, the change will be written in the user structure that has already been assigned to the variable.
- When the comments for a structure member are changed, the change will not be written to the comments for the variable that has already been assigned. Change the comments of the variable that has already been assigned accordingly after having assigned the structure member.

5.6.3 Assigning User Structures

When adding a global or local variable in the **Variable Registration** Dialog Box opened from the Variable Subwindow, a user structure can be assigned to the added global or local variable. Refer to *5.3.1(1) [b] Creating System Structures* for information on how to assign user structures.

5.6.4 Transferring User Structures

User structures can be transferred individually or as a batch, and compared using the program transfer function.

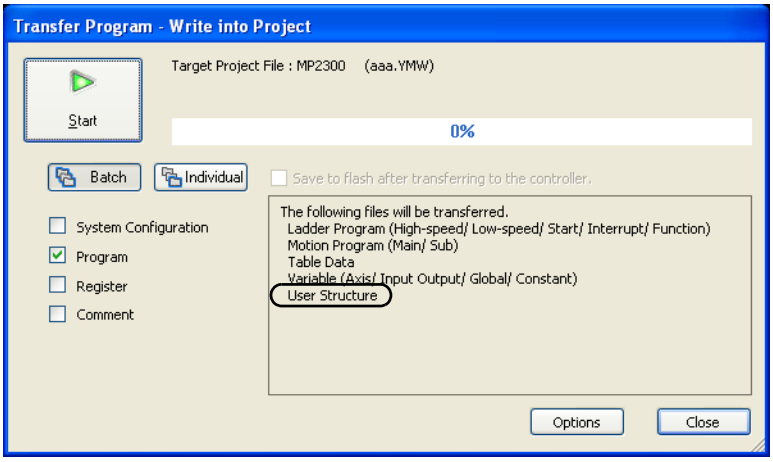
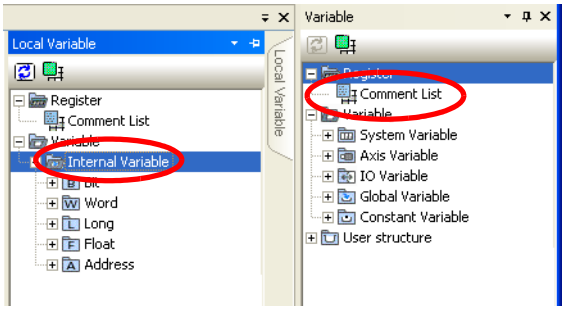


Fig. 5.1 Program Transfer Dialog Box when Write to Project is Selected

- Refer to *1.11 Transferring Data* for details on program transfer.

5.7 Comment Lists

Comments assigned to each register can be referenced and edited by data type from the *Comment List* in the Variable Subwindow and Local Variable Subwindow.



- The same comment list can be referenced regardless of whether the comment list is opened from the Variable Subwindow or the Local Variable Subwindow.

5.7.1 Referencing Comment Lists

Comment lists can be displayed by the following procedure, and comments can be referenced by register and data type.

(1) Referencing S, I, O, M, and C Register Comments

1. Double-click *Comment List* in the Variable Subwindow or the Local Variable Subwindow. Alternatively, right-click the *Comment List* in the **Local Variable** Window and select ***Edit*** from the pop-up menu that appears.

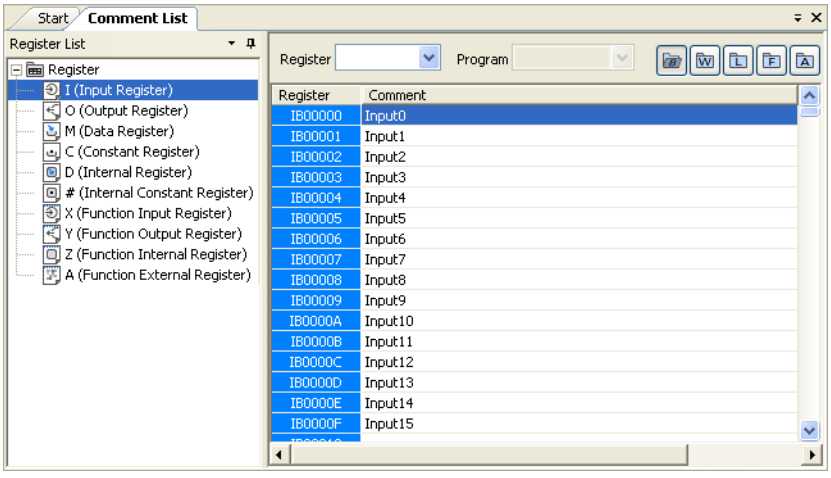
The comment list will open in the Main Window.

2. Select the register that is to be referenced from the *Register List*, or select ***Open*** from the pop-up menu that appears.

The comment list for the selected register will be displayed.

3. Specify the data type to be referenced using the **BIT**, **WORD**, **LONG**, **FLOAT**, or **ADDRESS** Button.

The comment list for the specified register and data type will be displayed.



Scroll the list to refer to the comment for the target register address.

Click the Close Button for the **Comment List** Tab Page to exit the list display.

- Enter the desired register address in the Register input field in the **Comment List** Tab Page. The list will scroll to display the entered register address.

(2) Referencing D, A, #, X, Y, and Z Register Comments

For the D, A, #, X, Y, and Z registers, use the following procedure to specify the program to be referenced and to display the comment list.

1. Double-click *Comment List* in the Variable Subwindow or the Local Variable Subwindow.

   The comment list will be opened in the Main Window.

2. Select from the *Register List* the register that is to be referenced, or select ***Open*** from the pop-up menu that will be displayed.

   The comment list for the selected register will be displayed.

3. Specify the data type to be referenced using the **BIT**, **WORD**, **LONG**, **FLOAT**, or **ADDRESS** Button.

4. Click the drop-down arrow for the *Program* Field, and select from the list the program to be referenced.

   The comment list for the specified program, register, and data type will be displayed.

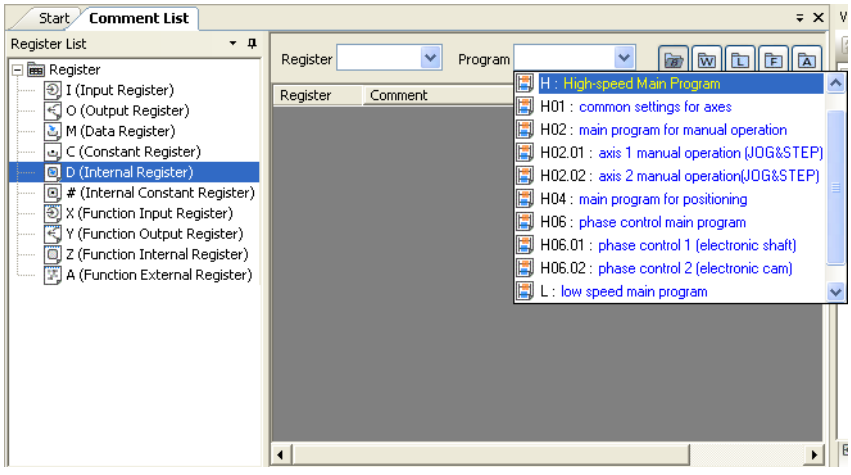


Fig. 5.2 Display Example: Comment List for D Register and BIT Data

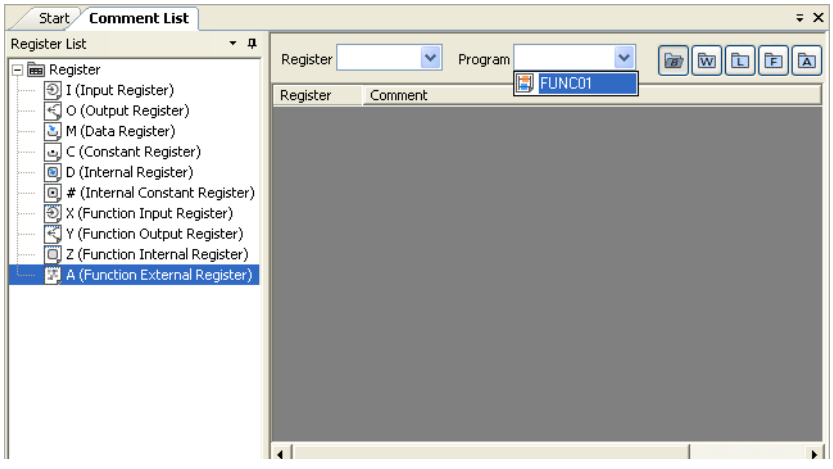


Fig. 5.3 Display Example: Comment List for A Register and BIT Data

Scroll the list to refer the comment for the target register address.
Click the Close Button for the **Comment List** Tab Page to exit the list display.

- Enter the desired register address in the Register input field in the **Comment List** Tab Page.

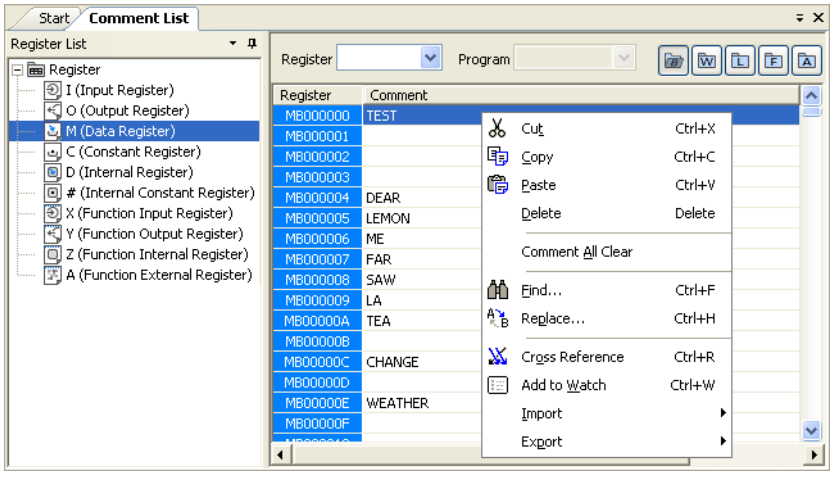
(3) Editing Comment Text

Double-click the *Comment* Field in the comment list or press the **F2** Key. The text cursor will be displayed, and the comment can then be edited. Press the **Enter** Key to save the edited comment.
After editing, the comments will be changed for all object subwindows using the applicable register.
Select ***File - Save*** from the Main Menu with the **Comment List** Tab Page open, or press the **Ctrl** + **S** Keys. The comment data will be stored in the project file or in the Machine Controller.

- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

(4) Editing with Pop-up Menus

The *Comment* Field can be edited by selecting it and right-clicking to display a pop-up menu. Multiple *Comment* Fields can be selected by dragging while holding down the **Shift** Key.



Cut, Copy, Paste, and Delete

Comments selected in the *Comment* Field can be cut, copied, pasted, or deleted. If multiple comments are to be pasted after cutting or copying them, they can be pasted in multiple *Comment* Fields starting from the selected *Comment* Field.

Comment All Clear

All comments displayed in the Main Window will be deleted. Comments cannot be recovered once they have been deleted.

Find

The comments in the registers displayed in the **Comment List** Tab can be searched.

Replace

The comments in the registers displayed in the **Comment List** Tab can be replaced.

Cross Reference and Add to Watch

The register for the comment selected will be added to the Cross reference Subwindow or the Watch Subwindow.

- For cross references, refer to *3.5.4 Cross Reference Searching*. For the watch function, refer to *6.2.2 Watch Function*.

Import

The CSV, CTF, and YST files in which the comments assigned to each variable are saved will be imported into MPE720 version 6.

Export

The comments assigned to each variable will be saved in a CSV, CTF, and YST files.

- Refer to *5.8 Exporting/Importing Variables* for details on import and export functions.

After editing, the comments will be changed for all objects and subwindows using the applicable register.

(5) Linking with External Editors

Text can be copied and pasted from external editors, such as Notepad.

5.7.2 Search/Replace/Delete in Comment List

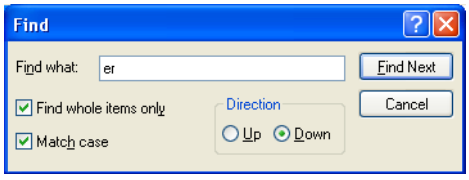
(1) Search in Comment List

The comments in the registers displayed in the **Comment** column can be searched.

1. Double-click the **Comment List** Tab in the Variable Subwindow and then select the **Comment** column.

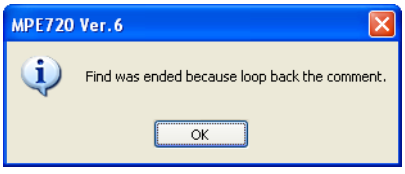
2. Select ***Edit*** - ***Find*** from the main menu, or right-click the **Comment** column and select **Find** from the pop-up menu.

   The **Find** Dialog Box will appear.



3. Enter a character string to search for, and then click **Find Next**. The cursor will move to the corresponding character string.

   When the search completes, the following message will appear.



(2) Replace in Comment List

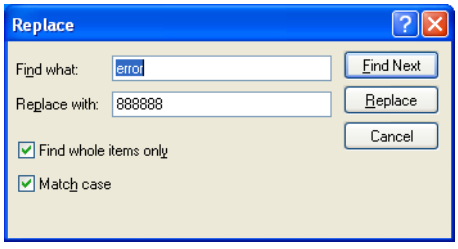
The comments in the registers displayed in the **Comment** column can be replaced with another character string.

1. Double-click the **Comment List** Tab in the Variable Subwindow, and then select the **Comment** column.

2. Select ***Edit*** - ***Replace*** from the main menu, or right-click the **Comment** column and select ***Replace*** from the pop-up menu.

   The **Replace** Dialog Box will appear.

3. Enter a character string to search for, and a character string to replace it with, and then click **Replace**.



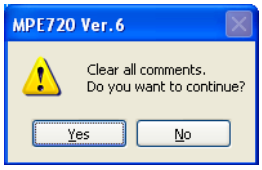
4. The character string that is input in the ***Find what*** text box will be searched for and replaced with the character string entered in the ***Replace with*** text box.

(3) Deleting All Comments

All the comment data in the **comment** column will be deleted.

1. Right-click the **Comment** column in the **Comment List** Tab of the Variable Subwindow, and select ***Comments All Clear*** from the pop-up menu.

The following message will appear asking whether or not to delete all comments.



Click **Yes** to delete all the comments in the **Comment** column.

5.8 Exporting/Importing Variables

Variables can be exported from an open project file on the MPE720 version 6 to a CSV, CTF, or YST file, or imported from a CSV, CTF, or YST file to the MPE720 version 6.
Export means to save variables, comments, and structures in a CSV, CTF, or YST file. Only CSV files can be edited in Microsoft Excel.
Import means to save the CSV, CTF, or YST file in MPE720 version 6 again.
The variable data exported from a project file can be imported for use in another project file.
Data in a CSV file can be edited in Excel as required, and the edited CSV file data can be imported to a project file.
The results of export and import are output to the Output Subwindow.

- Import can be executed regardless of Machine Controller model.
- Refer to *2.2.5 Exporting/Importing Motion Parameters* for information on exporting/importing motion parameters.

5.8.1 Exporting/Importing Global Variables, I/O Variables and Comments

(1) Outline

I/O variables, global variables, and I, O, M, and C register comments can be exported to CSV files. A desired file name can be set for each CSV file with a file extension ".CSV".
If a CSV file with the same name already exists in the export destination, the data of CSV file in the export destination will be deleted, and new data will be written.
The editing of CSV files is described below.

When a CSV file is opened, the data is displayed from left to right, "Register", "Comment", "Variable", and "Structure," as shown below. When nothing is set for "Comment", "Variable", and/or "Structure", the corresponding cell is left blank.

	A (Register)*1	B (Comment) *2	C (Variable)*3	D (Structure)*4
1	CW00001	Acceleration		
2	MB000001	RUN switch *5		
3	IF0007	I register	Ti	
4	MW00100		Data0 *6	
5	MA00200	PI parameter	PIParameter	PI_W
6	OL0687	Variable comments		

* 1. Enter a correct register.
* 2. Refer to the supplemental information given under step 2 of the structure assigning procedure in *5.3.1(1) [b] Creating System Structures* for details on the Comment Column.
* 3. Refer to the supplemental information given under step 2 of the structure assigning procedure in *5.3.1(1) [b] Creating System Structures* for information on how to assign variable names.
* 4. Displayed only when the register data type is ADDRESS.
  Refer to the supplemental information given under step 2 of the structure assigning procedure in *5.6.2 Creating User Structures* for information on Member Name and Member Comments.
* 5. When only comments are set, the Variable column will be left blank.
* 6. When only variables are set, the Comment column will be left blank.

The edited CSV file can be imported to the MPE720 version 6. The data in the import destination file will be overwritten with the data in the import source.

- Axis variables can be neither exported nor imported.
- Exporting/importing only a specified register range is not possible.
- Right-click the corresponding folder in the Variable Subwindow and select ***Export*** or ***Import*** from the pop-up menu to execute export or import.

An example of importing a CSV file is described below.
(A: Register, B: Comments, C: Variable, D: Structure)
(Example) The CSV file A is imported to the data B in the Variable Subwindow of the opened project file.
A: Import source (Data saved in the CSV file)

	A	B	C	D
1	MA00200	PI parameter	Parameter	PI_W
2	MB000000	Test		
3	MF00070		Ti	
4	MW00100	RUN speed		

B: Import destination (Data in the Variable Subwindow of the project file)

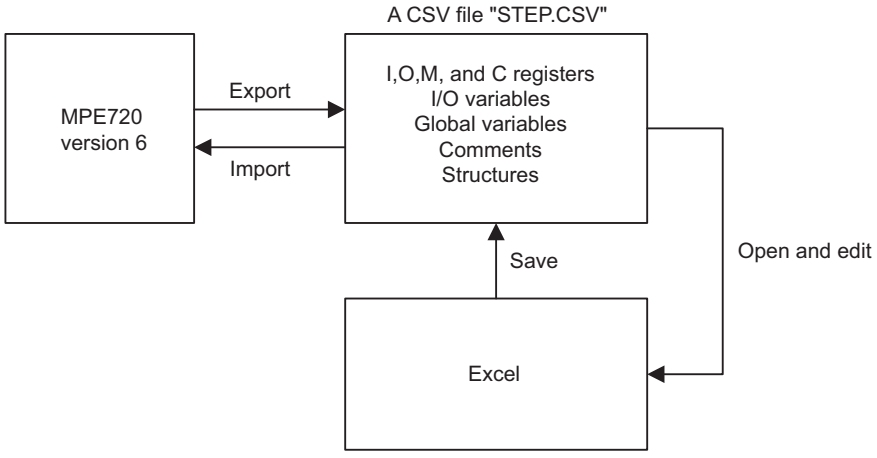
	A	B	C	D
1	MA00200	Data process	PIParameter	PID_F
2	MB000000		TESTER	
3	MF00070	Integration time		
4	MW00100		Drive	

Data after A was imported to B (Data in the Variable Subwindow of the project file)

	A	B	C	D
1	MA00200	PI parameter	Parameter	PI_W
2	MB000000	Test	TESTER	
3	MF00070		Ti	
4	MW00100	RUN speed	Drive	

- If the Comment column for the register of the CSV file that is the import source is blank but a comment exists for the same register at the destination, the comment at the destination will be deleted.
- If the Variable Column of the register in the import source (CSV file) is blank but a variable is set for the same register in the project file of the import destination, the variable in the import destination will not be overwritten and will remain unchanged.

The following diagram illustrates the data export and import operation flow.



(2) Procedures to Export/Import Data

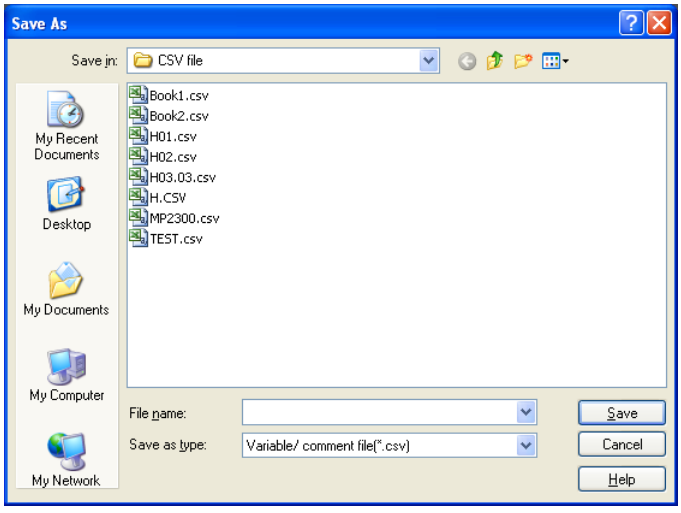
[a] Export

The assigned global variables and comments can be exported to a CSV file by using the following procedure.

1. Select ***File*** - ***Export*** - ***Global variables and comments*** from the main menu.

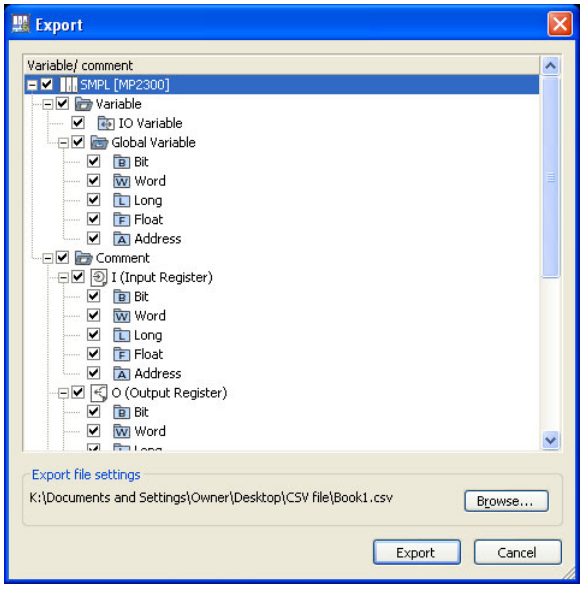
The **Save As** Dialog Box will appear.

2. Select a folder as the export destination from the **Save in** drop-down list, and enter a file name in the **File name** field. Then, click **Save**.

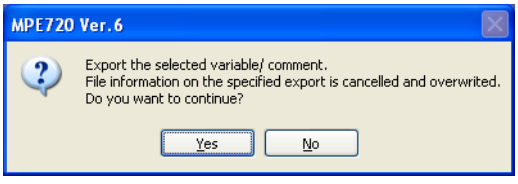


The **Export** Dialog Box will appear.

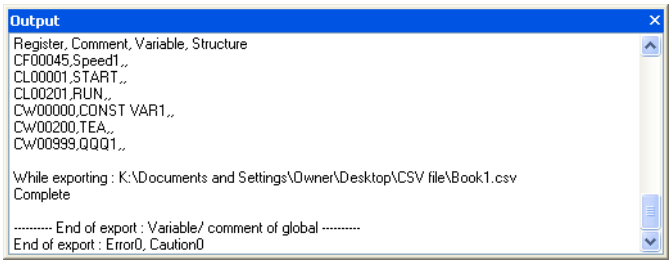
3. All the check boxes of variables and comments in the CSV file specified in step 2 will be selected. Clear the check boxes of the items not to be exported, and then click **Export**.



If **Browse** is clicked, the specified export destination (file name) or the **Save As** Dialog Box to create a file as the export destination will be displayed. To create a file, enter a file name and then click **Save** in the **Save As** Dialog Box.
The following message will appear asking for confirmation.


MPE720 Ver.6
Export the selected variable/ comment.
File information on the specified export is cancelled and overwrited.
Do you want to continue?
Yes
No

4. Click **Yes**. Data export will start, and the results will be displayed in the Output Subwindow.



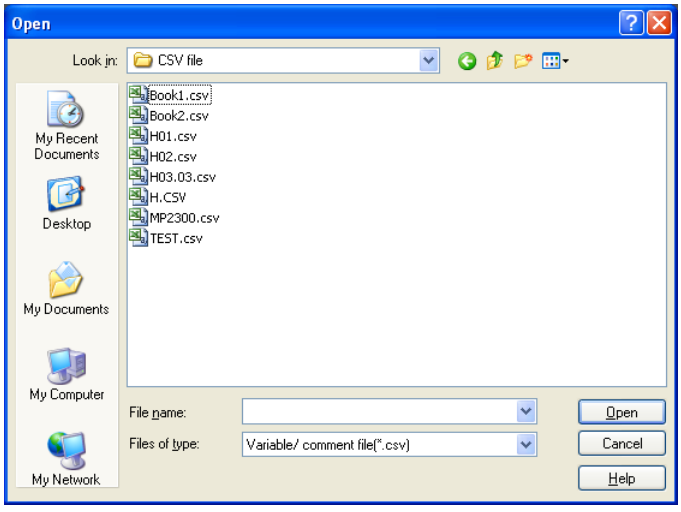
[b] Import

The global variables and comments in the CSV file can be imported to MPE720 version 6 using the following procedure.

1. Select ***File*** - ***Import*** - ***Global variables and comments*** from the main menu.

The **Open** Dialog Box will appear.

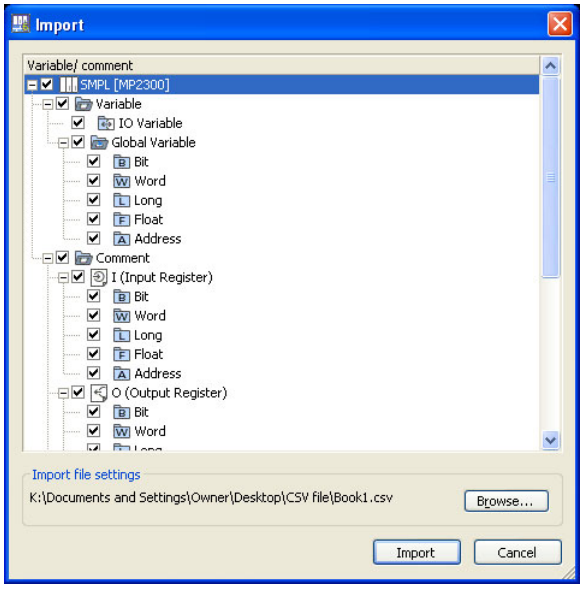
2. Select a CSV file to be imported, and then click **Open**.



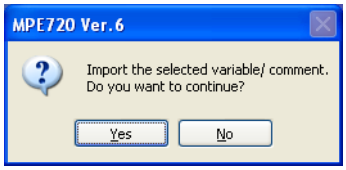
The **Import** Dialog Box will appear.

3. All the check boxes of variables and comments in the CSV file specified in step 2 will be selected. Clear the check boxes of the items not to be imported, and then click **Import**.

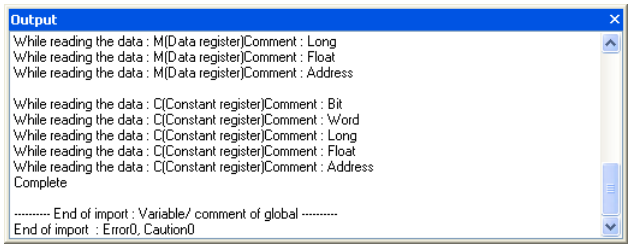
If you wish to reselect the CSV file to be imported, click **Browse**.



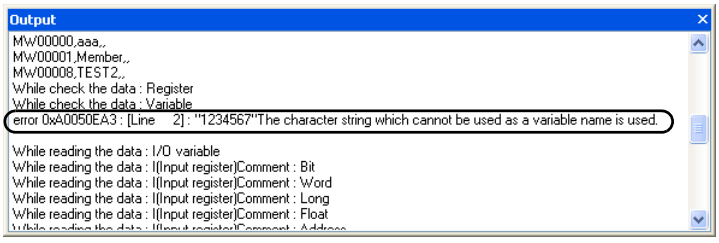
The following message will appear asking for confirmation.



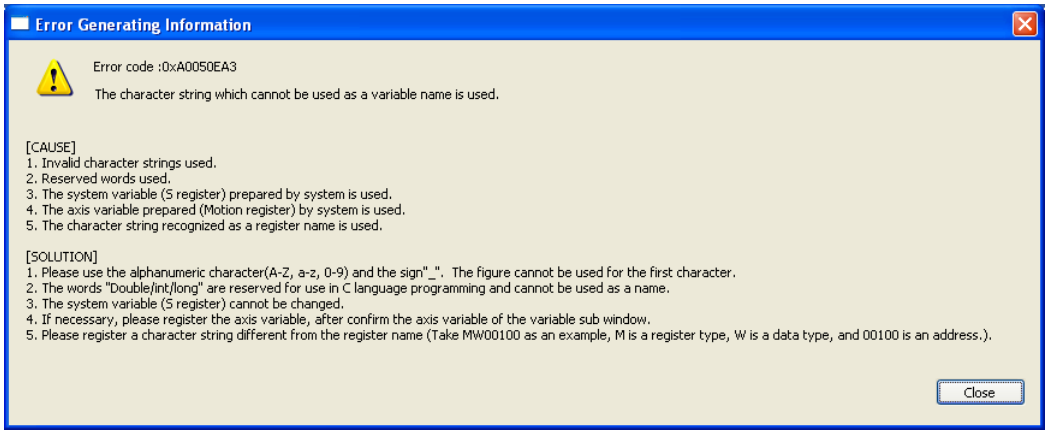
4. Click **Yes**. The selected data will start importing and the results will be displayed in the Output Subwindow.


Output
While reading the data : M(Data register)Comment : Long
While reading the data : M(Data register)Comment : Float
While reading the data : M(Data register)Comment : Address
While reading the data : C(Constant register)Comment : Bit
While reading the data : C(Constant register)Comment : Word
While reading the data : C(Constant register)Comment : Long
While reading the data : C(Constant register)Comment : Float
While reading the data : C(Constant register)Comment : Address
Complete
--------- End of import : Variable/ comment of global ---------
End of import : Error0, Caution0

An error code (0xAxxxxxxx) may be displayed in the Output Subwindow as follows.


Output
MW00000,aaa,,
MW00001,Member,,
MW00008,TEST2,,
While check the data : Register
While check the data : Variable
error 0xA0050EA3 : [Line 2] : "1234567"The character string which cannot be used as a variable name is used.
While reading the data : I/O variable
While reading the data : I(Input register)Comment : Bit
While reading the data : I(Input register)Comment : Word
While reading the data : I(Input register)Comment : Long
While reading the data : I(Input register)Comment : Float

Select the error code (0xAxxxxxxx) and then press the **F1** Key. The **Error Generating Information** Dialog Box will appear.


Error Generating Information
Error code :0xA0050EA3
The character string which cannot be used as a variable name is used.
[CAUSE]
1. Invalid character strings used.
2. Reserved words used.
3. The system variable (S register) prepared by system is used.
4. The axis variable prepared (Motion register) by system is used.
5. The character string recognized as a register name is used.
[SOLUTION]
1. Please use the alphanumeric character(A-Z, a-z, 0-9) and the sign"_". The figure cannot be used for the first character.
2. The words "Double/int/long" are reserved for use in C language programming and cannot be used as a name.
3. The system variable (S register) cannot be changed.
4. If necessary, please register the axis variable, after confirm the axis variable of the variable sub window.
5. Please register a character string different from the register name (Take MW00100 as an example, M is a register type, W is a data type, and 00100 is an address.).
Close

Check the error causes and take corrective action.

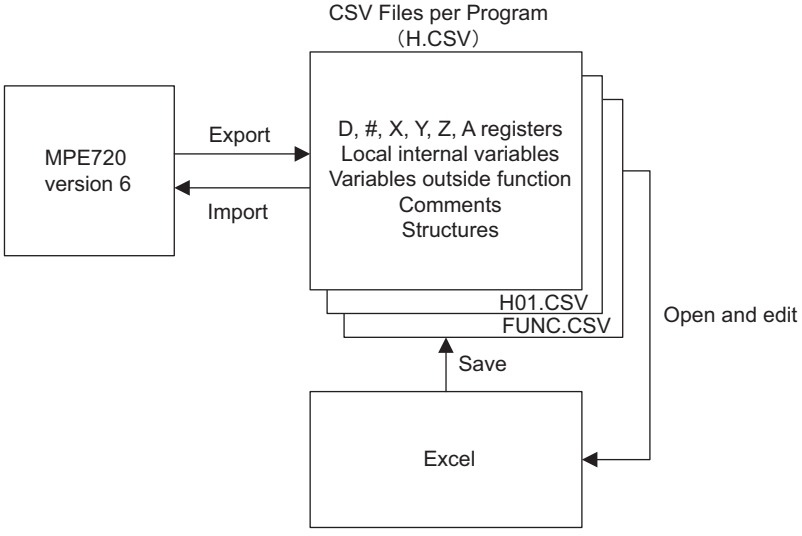
5.8.2 Exporting/Importing Local Variables and Comments

(1) Outline

Internal variables, variables outside functions, and D, #, X, Y, Z, and A register comments can be exported to a CSV file.
CSV files will be saved under the specified folder for each program.
MPE720 version 6 adds .csv to the program number, which is used as the file name. For the names of CSV files for three-level hierarchy programs, the period between levels will be omitted as shown below.
Example: CSV file name for H01: H01.csv
CSV file name for H02.03: H0203.csv
If a CSV file with the same name already exists in the export destination, the data of the CSV file in the export destination will be deleted and overwritten with the new data.

- The procedure to edit or display CSV files when exporting or importing is the same as for exporting or importing global variables and comments. Refer to *5.8.1 (1) Outline* for details.
- Right-click a folder in the Variable Subwindow and select ***Export*** or ***Import*** from the pop-up menu to implement the exporting or importing of data.

The following illustration shows the data export/import operation flow.



(2) Procedures to Export/Import Local Variables and Comments

[a] Export

The local variables and comments assigned for each program can be exported to a CSV file by using the following procedure.

1. Select ***File*** - ***Export*** - ***Local variables and comments*** from the main menu.

The **Browse For Folder** Dialog Box will appear.

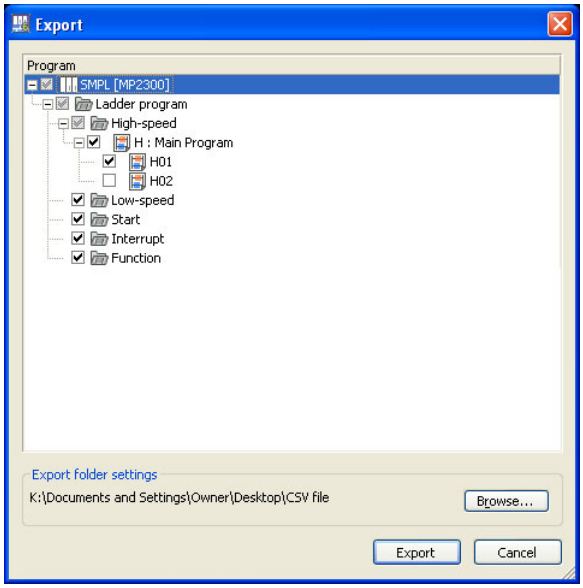
2. Select a folder as the export destination and then click **OK**.

To create a new folder, click **Make New Folder** to enter a folder name.

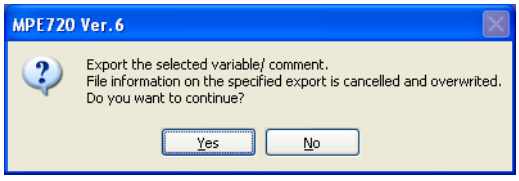


The **Export** Dialog Box will appear.

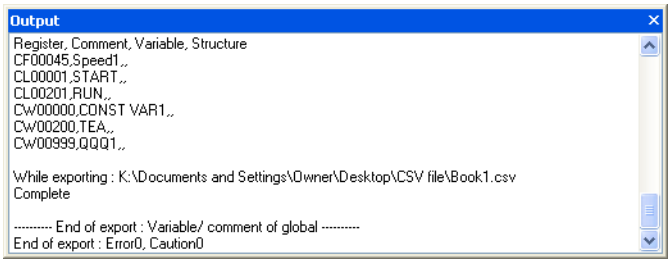
3. All the check boxes of ladder programs (CSV files) in the folder specified in step 2 will be selected. Clear the check boxes of ladder program data not to be exported, and then click the **Export** Button.



The following message will appear asking for confirmation.


MPE720 Ver.6
Export the selected variable/ comment.
File information on the specified export is cancelled and overwrited.
Do you want to continue?
Yes
No

Click **Yes**. Data export will start, and the results will be displayed in the Output Subwindow.



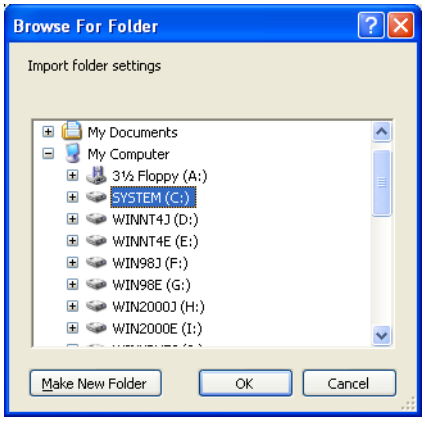
[b] Import

The local variables and comments assigned for each program can be imported from the CSV file to the MPE720 version 6 by using the following procedure.

1. Select ***File*** - ***Import*** - ***Local variables and comments*** from the main menu.

The **Browse For Folder** Dialog Box will appear.

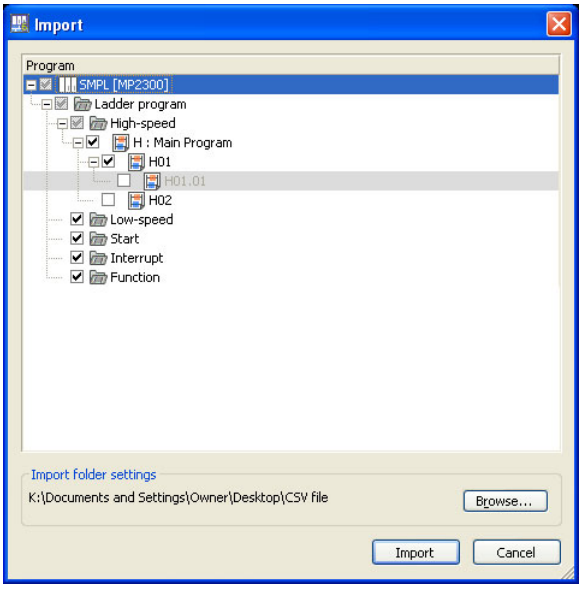
2. Select the folder in which the data to be imported is saved, and then click **OK**.



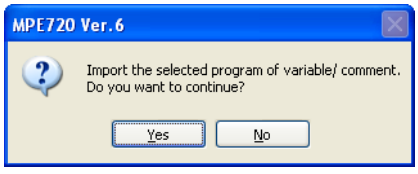
The **Import** Dialog Box will appear.

3. All the check boxes of ladder programs (CSV files) in the folder specified in step 2 will be selected. Clear the check boxes of ladder programs not to be imported, and then click **Import**.

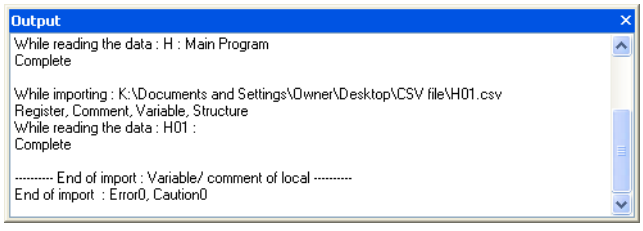
If you wish to change the import source folder, click **Browse**.



The following message will appear asking for confirmation.



4. Click **Yes**. The selected files will start importing, and the results will be displayed in the Output Subwindow.


Output
While reading the data : H : Main Program
Complete
While importing : K:\Documents and Settings\Owner\Desktop\CSV file\H01.csv
Register, Comment, Variable, Structure
While reading the data : H01 :
Complete
---------- End of import : Variable/ comment of local ----------
End of import : Error0, Caution0

5.8.3 Exporting/Importing Constant Variables

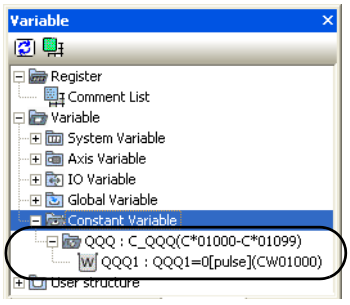
(1) Overview

Constant variables, registers, comments, units, and values in a constant group variable can be exported.
The exported files will be saved in the specified folder for each constant group variable. The data will be exported with the constant group variable name with a CTF file extension.
If a CTF file with the same name already exists at the export destination, the data of CTF file in the export destination will be deleted and overwritten with the new data.
The data in the CTF files can be imported to the MPE720 version 6 as they are.

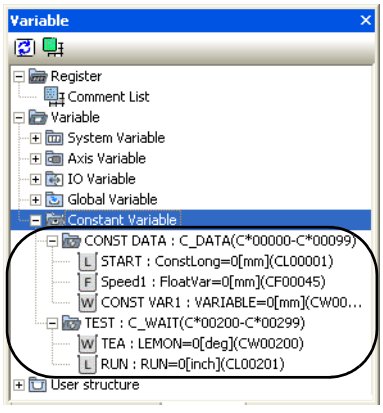
- CTF files cannot be edited.

An example of a constant variable folder importing operation is shown below.

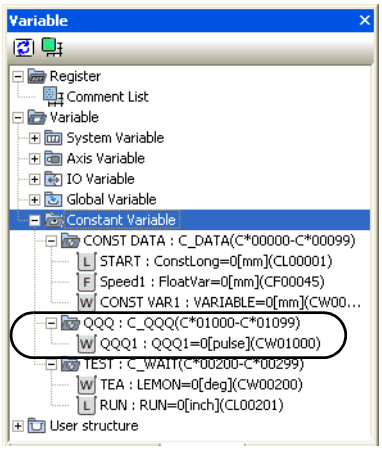
A: Constant Variable Import Source Folder



B: Constant Variable of Import Destination Folder

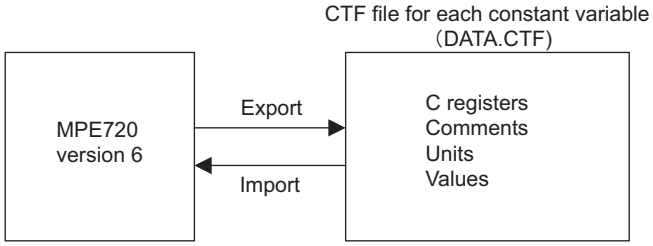


Constant Variable Folder after A is imported to B



- Right-click a folder in the Variable Subwindow and select ***Export*** or ***Import*** from the pop-up menu to export or import.

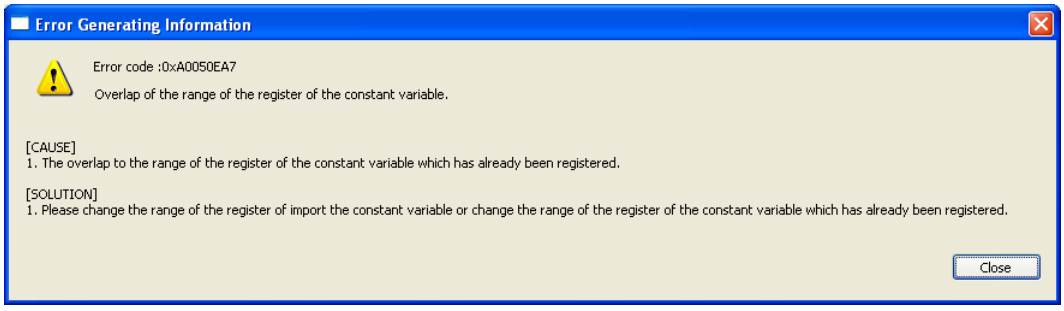
The following diagram outlines the export and import operation flow.



■ When the Register Ranges in Import Source and Destination Overlap

When some registers to be imported overlap with those in the import destination, the following error message will appear. Change the register range either in the import source or in the destination, as overlapping registers cannot be imported.

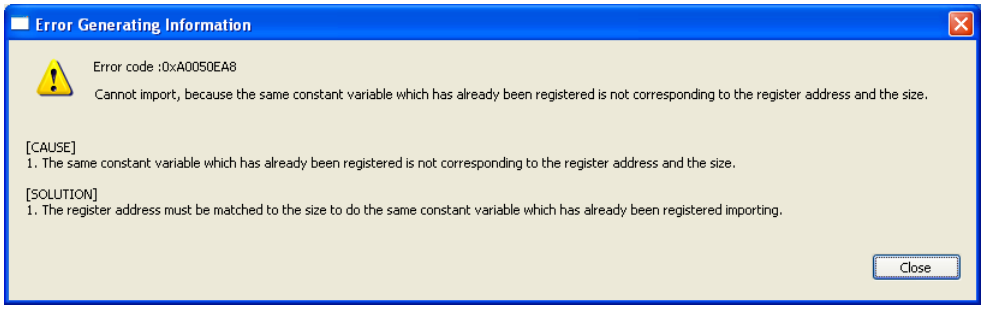
(Example) Register range specified in the import source: CW00000 to CW00099
Register range specified in the import destination: CW00098 to CW00197


Error Generating Information
Error code :0xA0050EA7
Overlap of the range of the register of the constant variable.
[CAUSE]
1. The overlap to the range of the register of the constant variable which has already been registered.
[SOLUTION]
1. Please change the range of the register of import the constant variable or change the range of the register of the constant variable which has already been registered.
Close

■ When the Register Ranges in the Import Source and Destination Overlap, and the Same Constant Variables Exist in the Import Destination

When the register range of the constant group variable overlaps with that of the import destination and the same constant variables exist in the import destination, the following **Error Generating Information** Dialog box will appear. Constant variables as identical to those in the import destination cannot be imported.

- If the register range is not overlapping with that in the import destination, the **Error Generating Information** Dialog box will not appear, even if the constant variables are the same as those in the import destination.


Error Generating Information
Error code :0xA0050EA8
Cannot import, because the same constant variable which has already been registered is not corresponding to the register address and the size.
[CAUSE]
1. The same constant variable which has already been registered is not corresponding to the register address and the size.
[SOLUTION]
1. The register address must be matched to the size to do the same constant variable which has already been registered importing.
Close

(2) Procedures to Export/Import Constant Variables

[a] Export

Data of constant variables can be exported group by group to CTF files in the selected folder by using the following procedure.

1. Select ***File*** - ***Export*** - ***Constant variables*** from the main menu.

The **Browse For Folder** Dialog Box will appear.

2. Select a folder for export destination, and then click **OK**.

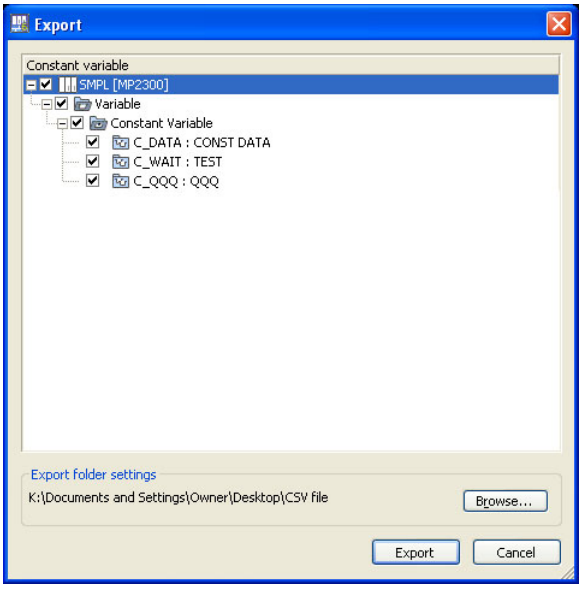
To create a new folder, click **Make New Folder** to enter a folder name.



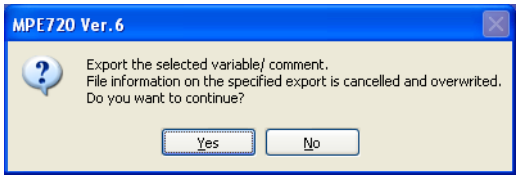
The **Export** Dialog Box will appear.

3. All the check boxes of constant variables (CTF files) in the folder specified in step 2 will be selected. Clear the check boxes of the items not to be exported and then click **Export**.

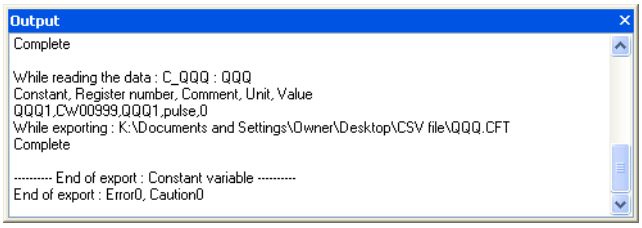
If you wish to change the export destination folder, click **Browse**.



The following message will appear asking for confirmation.


MPE720 Ver.6
Export the selected variable/ comment.
File information on the specified export is cancelled and overwrited.
Do you want to continue?
Yes
No

4. Click **Yes**. Data export will start and the results will appear in the Output Subwindow.


Output
Complete
While reading the data : C_QQQ : QQQ
Constant, Register number, Comment, Unit, Value
QQQ1,CW00999,QQQ1,pulse,0
While exporting : K:\Documents and Settings\Owner\Desktop\CSV file\QQQ.CFT
Complete
---------- End of export : Constant variable ----------
End of export : Error0, Caution0

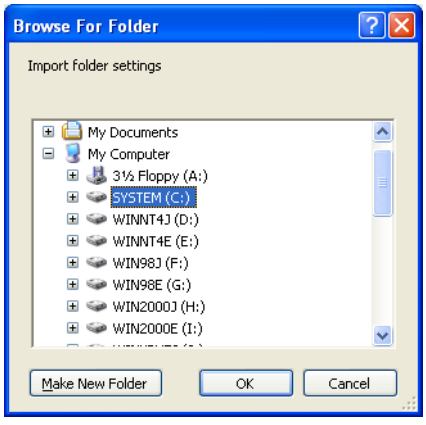
[b] Import

Data of constant variables can be imported group by group to MPE720 version 6 using the following procedure.

1. Select ***File*** - ***Import*** - ***Constant variables*** from the main menu.

The **Browse For Folder** Dialog Box will appear.

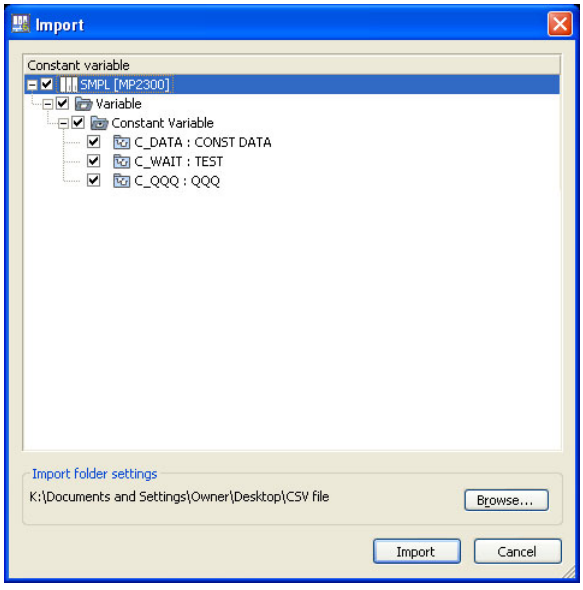
2. Select the folder in which the data to be imported is saved, and then click **OK**.



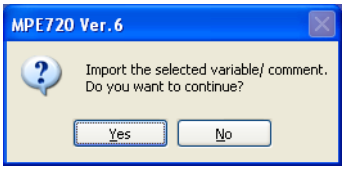
The **Import** Dialog Box will appear.

3. All the check boxes of constant variables (CTF files) in the folder specified in step 2 will be selected. Clear the check boxes of the items not to be imported, and then click **Import**.

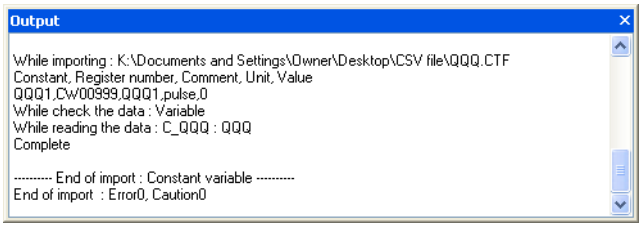
If you wish to change the import source folder, click **Browse**.



The following message will appear asking for confirmation.



4. Click **Yes**. The selected files will start importing and the results will appear in the Output Subwindow.

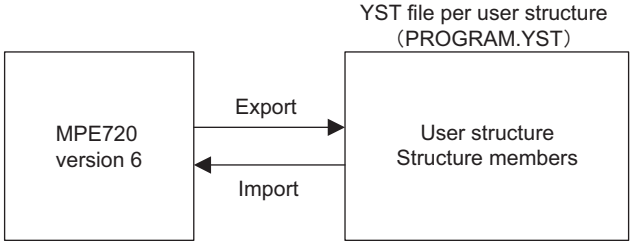

Output
While importing : K:\Documents and Settings\Owner\Desktop\CSV file\QQQ.CTF
Constant, Register number, Comment, Unit, Value
QQQ1,CW00999,QQQ1,pulse,0
While check the data : Variable
While reading the data : C_QQQ : QQQ
Complete
--------- End of import : Constant variable ---------
End of import : Error0, Caution0

5.8.4 Exporting/eImporting User Structures

A user structure that contains data of the structure members can be exported to a YST file from the MPE720 version 6.
A desired name can be set for a YST file with a file extension .YST.
If a YST file with the same name already exists in the export destination, the data of the YST file in the export destination will be deleted and overwritten with the new data.

- YST files cannot be edited.

The exported data in a YST file can be imported to the MPE720 version 6 as is.
The data in the destination file will be overwritten with the data in the imported file.
The following diagram illustrates the export/import operation flow.



(1) Procedures to Export and Import User Structures

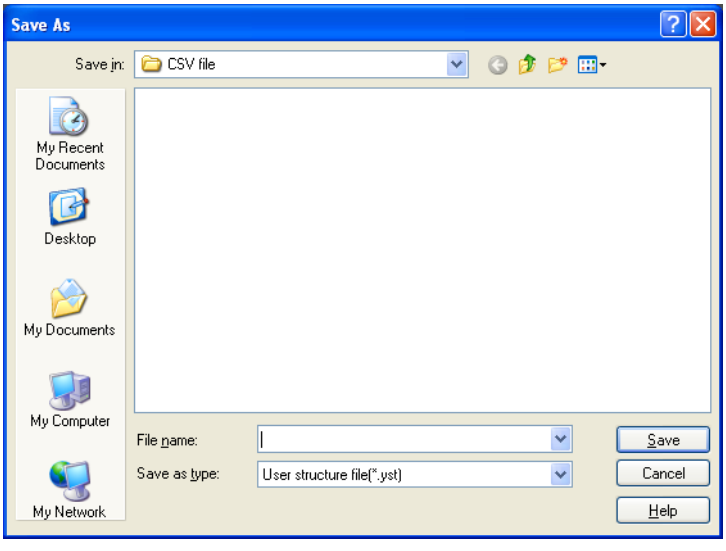
[a] Export

Data of a user structure can be exported to a YST file by using the following procedure.

1. Select ***File*** - ***Export*** - ***User structure*** from the main menu.

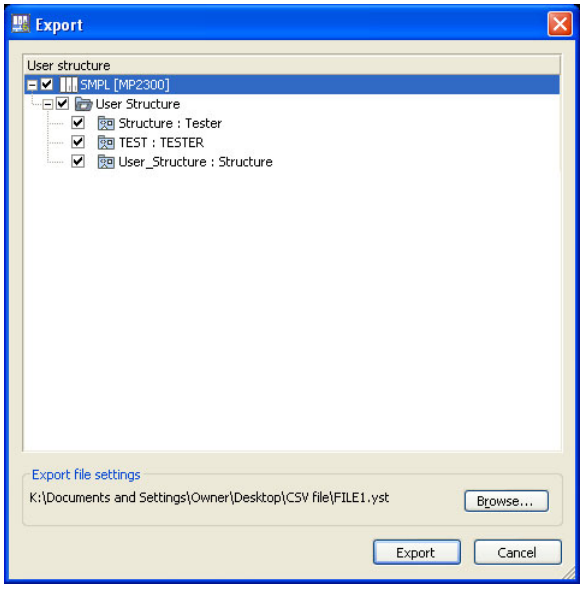
The **Save As** Dialog Box will appear.

2. Select a folder as the export destination from the ***Save in*** drop-down list and enter a file name in the **File name** Field. Then, click **Save**.



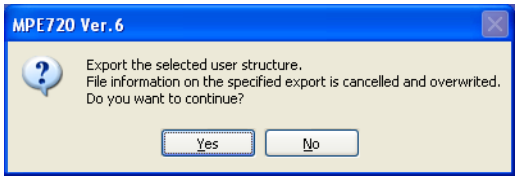
The **Export** Dialog Box will appear.

3. All the check boxes of user structures in the YST file specified in step 2 will be selected. Clear the check boxes of user structures that are not to be exported, and then click **Export.**

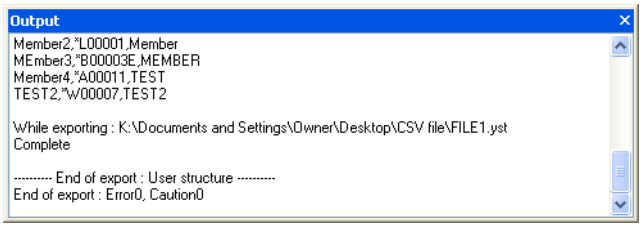


If **Browse** is clicked, the already specified export destination (file name) or the **Save As** Dialog Box to create a file for export destination will appear. To create a new file, enter a file name and click **Save** in the **Save As** Dialog Box.

The following message will appear asking for confirmation.


MPE720 Ver.6
Export the selected user structure.
File information on the specified export is cancelled and overwrited.
Do you want to continue?
Yes
No

4. Click **Yes**. Data export will start and the results will appear in the Output Subwindow.



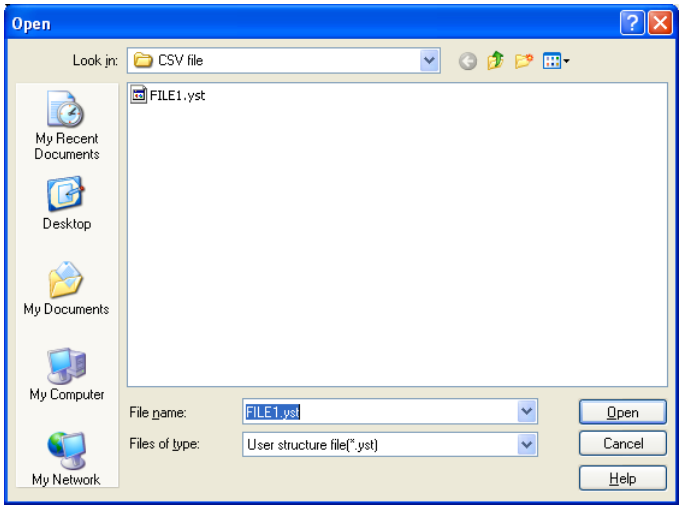
[b] Import

Data of user structures saved in a YST file can be imported to the MPE720 version 6 by using the following procedure.

1. Select ***File*** - ***Import*** - ***User structure*** from the main menu.

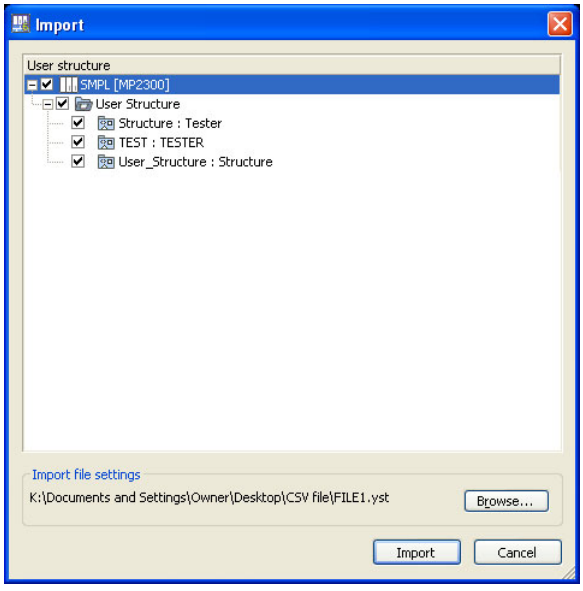
The **Open** Dialog Box will appear.

2. Select a YST file to be imported and then click **Open**.

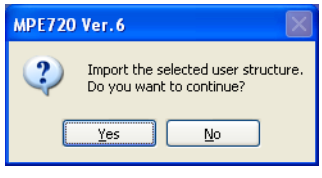


The **Import** Dialog Box will appear.

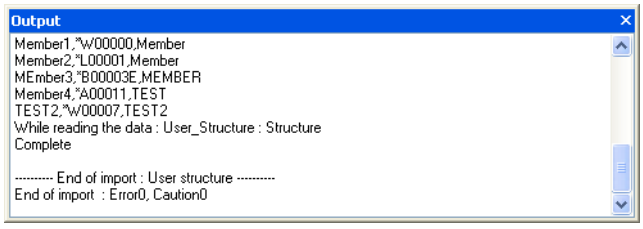
3. All the check boxes of user structures in the YST file specified in step 2 will be selected. Clear the check boxes of user structures not to be imported, and then click **Import**.



The following message will appear asking for confirmation.



4. Click **Yes**. The selected structures will start importing and the results will appear in the Output Subwindow.

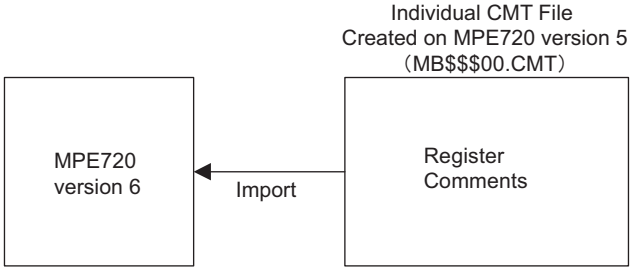


5.8.5 Importing MPE720 Version 5 CMT Files

The registers and comments used in the comment list of MPE720 version 5 can be imported to MPE720 version 6.
The data of the file in the export destination will be overwritten with the data of the imported file.
The table below lists the comment files that can be imported.

- CMT files cannot be edited.
- CMT files cannot be exported from MPE720 version 6 to MPE720 version 5.

Comment File	Register	Data Type that Can be Imported
MB$$$00.CMT	M register	BIT type comments
MW$$$00.CMT	M register	WORD, LONG, FLOAT, and ADDRESS type comments
OB$$$00.CMT	O register	BIT type comments
OW$$$00.CMT	O register	WORD, LONG, FLOAT, and ADDRESS type comments
IB$$$00.CMT	I register	BIT type comments
IW$$$00.CMT	I register	WORD, LONG, FLOAT, and ADDRESS type comments
CB$$$00.CMT	C register	BIT type comments
CW$$$00.CMT	C register	WORD, LONG, FLOAT, and ADDRESS type comments
xxxxxxxx.CMT	—	Local comments for each program



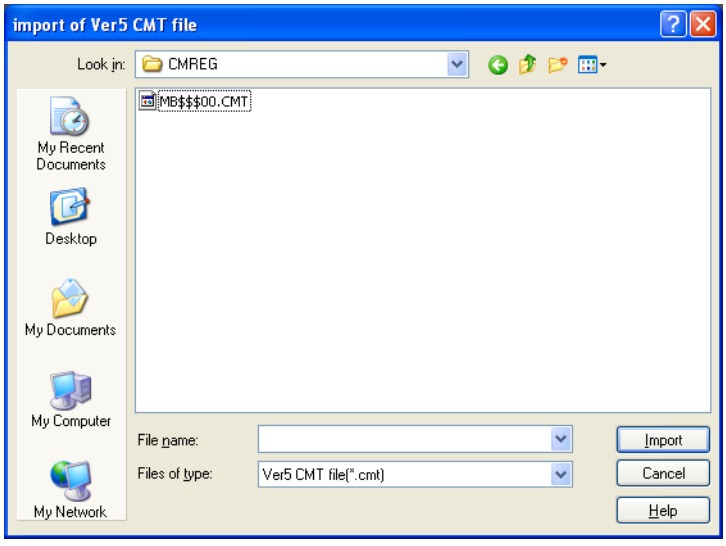
(1) Importing Comment Data Created on MPE720 Version 5

The local comment and register data created on the MPE720 version 5 for each program can be individually imported to the MPE720 version 6 by using the following procedure.

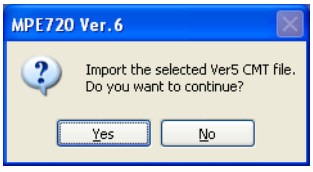
1. Select ***File*** - ***Import*** - ***Ver5 CMT file*** from the main menu.

The ***import of Ver5 CMT file*** Dialog Box will appear.

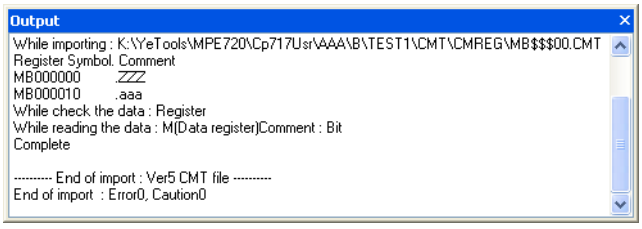
2. Select a CMT file to be imported, and then click **Import**.



The following message will appear asking for confirmation.



3. Click **Yes**. The CMT file will start importing and the results will appear in the Output Subwindow.


Output
While importing : K:\YeTools\MPE720\Cp717Usr\AAA\B\TEST1\CMT\CMREG\MB$$$00.CMT
Register Symbol. Comment
MB000000 .ZZZ
MB000010 .aaa
While check the data : Register
While reading the data : M(Data register)Comment : Bit
Complete
---------- End of import : Ver5 CMT file ----------
End of import : Error0, Caution0

- The data that can be imported is limited to registers and comments. When you wish to use the symbols to which comments are assigned on the MPE720 version 5 for variables on the MPE720 version 6, use the following procedure to import the symbols to the MPE720 version 6.
  1. Select ***File*** - ***Import*** - ***Global variables and comments*** from the main menu. Alternatively, select ***File*** - ***Import - Local variables and comments***. Then, create a CSV file.
  2. Open the CSV file to enter symbols in the variable column.
  3. Import the edited CSV file to the MPE720 version 6.

  In this way, the symbols used in the MPE720 version 5 can be used as the variables in the MPE720 version 6.

Chapter 6

Monitoring

This chapter describes how to monitor items such as register status and the operating status of connected Machine Controllers.

6.1 Types of Monitoring ----------6-2

6.2 Detailed Descriptions of Monitoring Operations ----------6-3

6.2.1 Register Lists ---------- 6-3
6.2.2 Watch Function ---------- 6-6
6.2.3 Displaying Online Current Value ---------- 6-8
6.2.4 Displaying Offline Current Value ---------- 6-9
6.2.5 System Monitor ---------- 6-10

6.1 Types of Monitoring

The following six monitoring functions are supported by MPE720 version 6.

- Trace Monitoring

  Trace monitoring is used to monitor and trace the values of specified variables (registers) at specific time intervals in a graphical or chart format.
  For details, refer to *Chapter 7 Data Tracing*.

- Register Lists

  A register list displays the values (memory map) of registers in consecutive areas. This enables real-time monitoring when a Machine Controller is connected. The values can be edited. For details, refer to *6.2.1 Register Lists*.

- Watch

  The watch function displays the values of specified registers in a list. This enables realtime monitoring when a Machine Controller is connected. The values can be edited. For details, refer to *6.2.2 Watch Function*.

- Online Current Value Display

  While online, the values are displayed in the ladder program. For details, refer to *6.2.3 Displaying Online Current Value*.

- Offline Current Value Display

  While offline, the values that are stored in registers are displayed in the ladder program. For details, refer to *6.2.4 Displaying Offline Current Value*.

- System Monitor

  The system monitor is used to monitor Machine Controller status while a Machine Controller is connected (i.e., while online). For details, refer to *6.2.5 System Monitor*.

These functions are described in detail on the following pages.

6.2 Detailed Descriptions of Monitoring Operations

6.2.1 Register Lists

With the register list function, the current values of registers in consecutive areas (memory map) can be monitored in a Register List Subwindow (1, 2, or 3). This enables realtime monitoring when a Machine Controller is connected. The current data can be edited.

- Project file data is used for the memory map display and for duplicated register searches. If after opening the project file and connecting to the Controller, the project file and Controller data are different and memory maps are displayed or multiple registers are searched, results may be displayed that do not match the Controller.

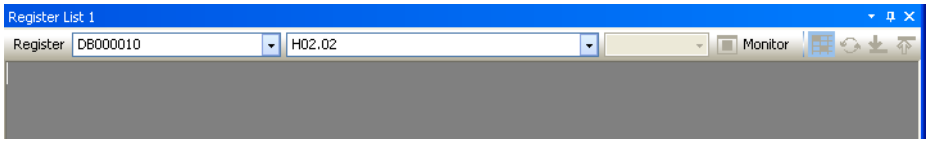
(1) Displaying Memory Maps

1. Click a tab to select one of the Register List Subwindows (1, 2, or 3).

Select ***Monitor*** - ***Register List*** from the Launcher. The Register List 1 Subwindow will automatically be displayed.

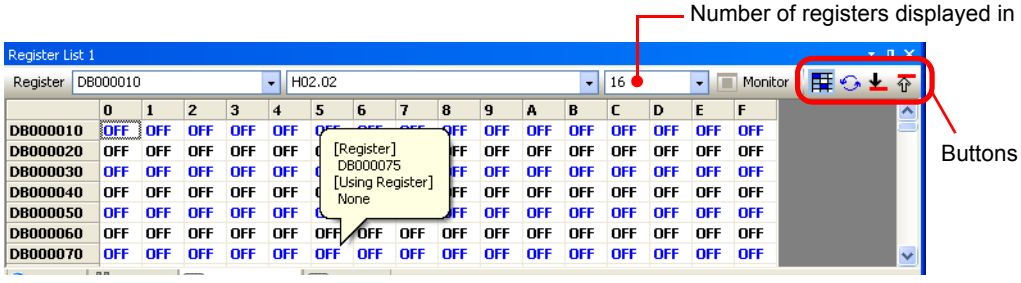
- The display of the Register List Subwindow can be switched ON and OFF by selecting ***Display*** - ***Register List*** - ***Register List 1*** (or 2 or 3) from the Main Menu.

2. In the *Register* Field, Enter the register address to be displayed in the memory map. To display a D register list, also enter the program number as shown below.

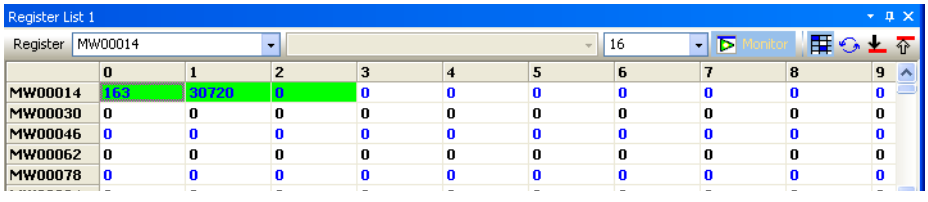


3. Press the **Enter** Key.

A memory map will be displayed with the specified register address in the top row.



Memory Map Example for D Registers and Balloon Display Example



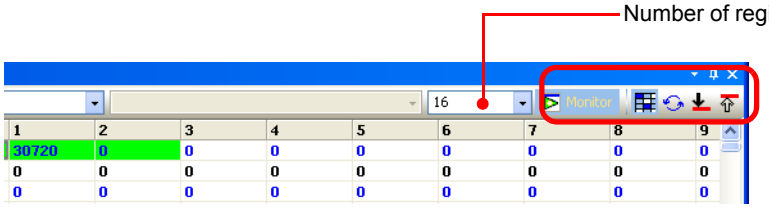
Memory Map Example for M Registers

- The scroll bar can be moved to change the register range that is being displayed.
- When the cursor is moved on the memory map, the register address at the cursor position will be shown with the usage status in a balloon display.
- The number of registers displayed in one row can be changed. The display can also be changed using the five buttons at the upper right of the list.

- Right-click the register list, and select decimal, hexadecimal, binary, or ASCII from the pop-up menu to change the data type in the *Value* Fields. The type cannot be changed, however, for data types B and F.
- Characters are displayed in blue and black in alternating rows.
- The **Monitor** Icon is valid while a Machine Controller is connected (while online).
- In the screen shown in step 3 on the previous page, a green background indicates that the register is used in a ladder program. A red background indicates that the register is used for more than one data type. This color-coded display is enabled when the **Memory Map Display** Button is ON .
- For details on the number of registers displayed in one row and on using the five buttons, refer to *(2) Changing Memory Map Displays*, below.

(2) Changing Memory Map Displays

The number of registers displayed in one row can be changed. In addition, the memory map display can be changed using the five buttons displayed in the upper right.



■ Number of Registers Displayed in One Row

The number of registers displayed in one row can be changed between 1 and 16 by entering a number directly or by selecting from a list (always 16 for BIT type). When *Automatic* is selected, the number of registers displayed will automatically be set to match the display size of the Register List Subwindow.

■ Monitor Button: ON Monitor OFF Monitor

This button is valid only while online. It toggles between ON and OFF each time it is clicked.
When monitoring is set to ON, register data is continually refreshed and displayed. When monitoring is set to OFF, the data is not refreshed.

■ Memory Map Display Button: Display ON Display OFF

This button toggles the display between ON and OFF each time it is clicked.
When the display is ON, registers used in the ladder program are displayed with a green background and registers used for more than one data type are displayed with a red background.
When the display is OFF, all registers are displayed with a white background.

■ Memory Map Refresh Button

Click this button to refresh the register map display.

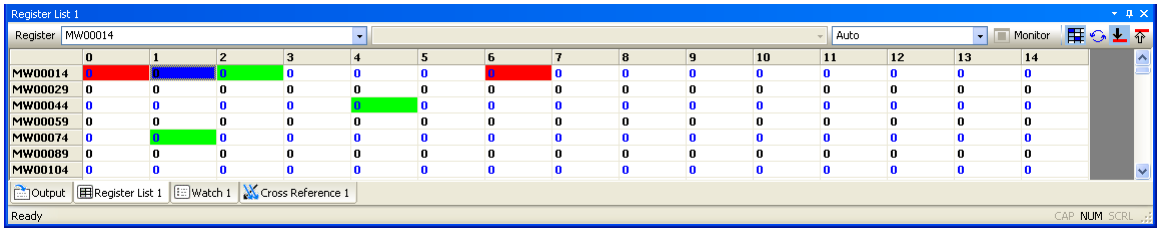
- The **Memory Map Refresh** Button is invalid when the display is turned OFF by the **Memory Map Display** Button.

■ Duplicated Register Search (Up/Down) Buttons /

These buttons are used to find and display registers that are used for more than one data type. The buttons with the up and down arrows are used to search up and down.

- These buttons are invalid when the display is turned OFF by the **Memory Map Display** Button.

The search results are displayed in the Output Subwindow. Registers used for more than one data type are displayed with a blue background.



(3) Editing Data

With a memory map, double-clicking a data cell or pressing the **F2** Key will display the text cursor and enable the following editing operations.

- Entering data directly
- Deleting (setting to 0)
- Copying and pasting

Press the **Enter** Key to save the edited data. While online, the changes in the data will be directly reflected in Machine Controller operations.

6.2.2 Watch Function

With the watch function, values and comments for specified registers (S, I, O, M, C, or D) can be monitored in the Watch Subwindow (1, 2, or 3). This enables realtime monitoring when a Machine Controller is connected. The values can be edited.

- When Project Link Connection is used, the data registered in the Watch Subwindow will be saved only in the Machine Controller. To write the data in the project file, transfer the data from the Machine Controller by executing the ***Read from Controller*** command and selecting the **Batch** Button. (Refer to *1.11.5 Reading from Machine Controllers*.)

(1) Display Watch Data

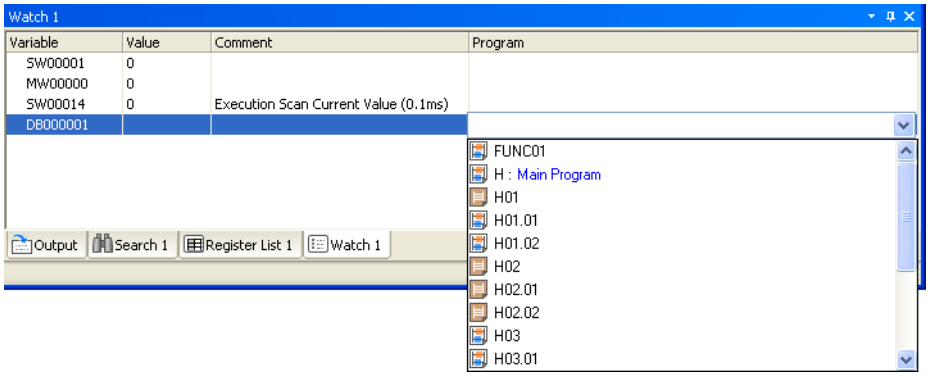
1. Click a tab to select one of the Watch Subwindows (1, 2, or 3).

Select ***Monitor*** - ***Watch*** from the Launcher. The Watch 1 Subwindow will automatically be displayed.

- To display or hide a Watch Subwindow (1, 2, or 3), select ***Display*** - ***Watch*** - ***Watch 1 (or 2 or 3)*** from the Main Menu. The display will be toggled ON and OFF.

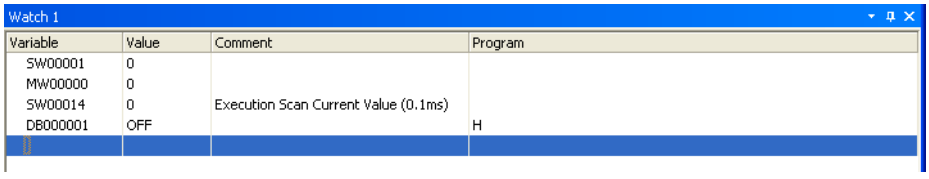
2. Display the text cursor by either double-clicking the *Variable* Field or pressing the **F2** Key, and then enter the register or variable that is to be watched. The register or variable can be entered by dragging and dropping, or copying and pasting from a ladder program or the Variable Subwindow.

To watch a D register, also enter the program number as shown below.



3. Press the **Enter** Key.

The contents of the specified register will be displayed.



Right-click the row, and select decimal, hexadecimal, binary, or ASCII from the pop-up menu to change the data type in the *Value* Field.

(2) Editing Values

With the watch function, double-clicking the *Value* Field or pressing the **F2** Key will display the text cursor in the *Value* Field and enable the following editing operations.

- Entering data directly
- Copying and pasting

Press the **Enter** Key to save the edited data. While online, the changes in the data will be directly reflected in Machine Controller operations.

- Comments cannot be edited.

6.2.3 Displaying Online Current Value

While connected to the Machine Controller (while online), the status of the following items can be monitored on the ladder program screen.

- The current values for each object are displayed in blue characters.
- Constant and coil instructions are highlighted when the register value is 1.
- IF and ELSE instructions are highlighted when the condition is satisfied.

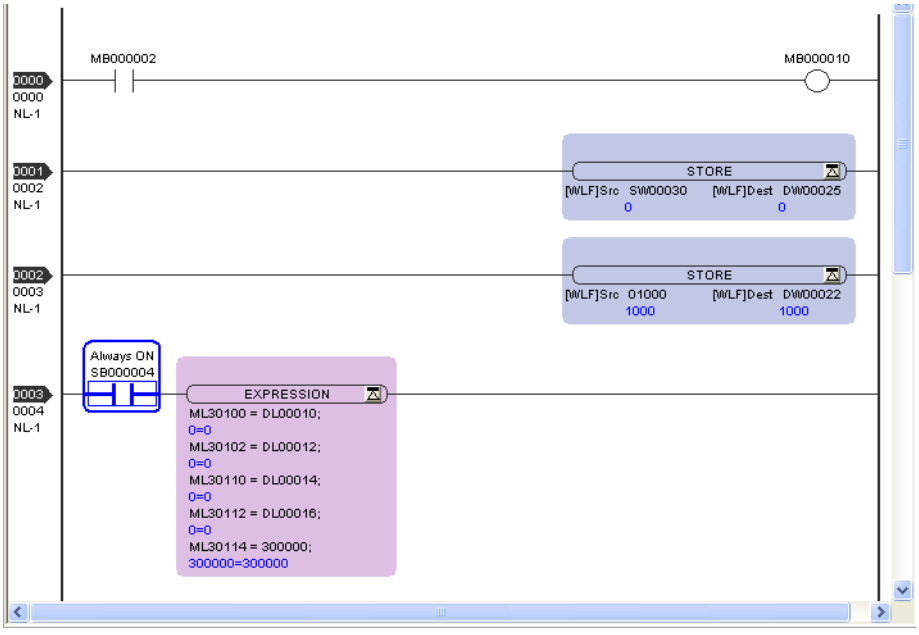


Fig. 6.1 Display Example of Register Current Value

- If "!=" is used in an EXPRESSION instruction, the operation item on the right side of the equation may display an inverted current value. If this happens, 1 will be displayed in place of 0, so online current value display may be inconsistent, as shown below.



6.2.4 Displaying Offline Current Value

While a Machine Controller is not connected (while offline), the current values of the registers can be viewed in blue characters by selecting ***Display - Offline Current Value*** from the main menu.

- The offline current value function is not supported for the IF/ELSE, WHILE, and EXPRESSION instructions.
- When register data is read using data transfer from the Machine Controller (i.e., when the *Register* Checkbox is selected for reading from the Controller), the register data that is read will be displayed.
- When register values are changed by a means such as a register list, the data for the applicable register will be refreshed but simulation will not be executed (i.e., data will not be written due to a program condition turning ON). Therefore, no other register data will be refreshed.

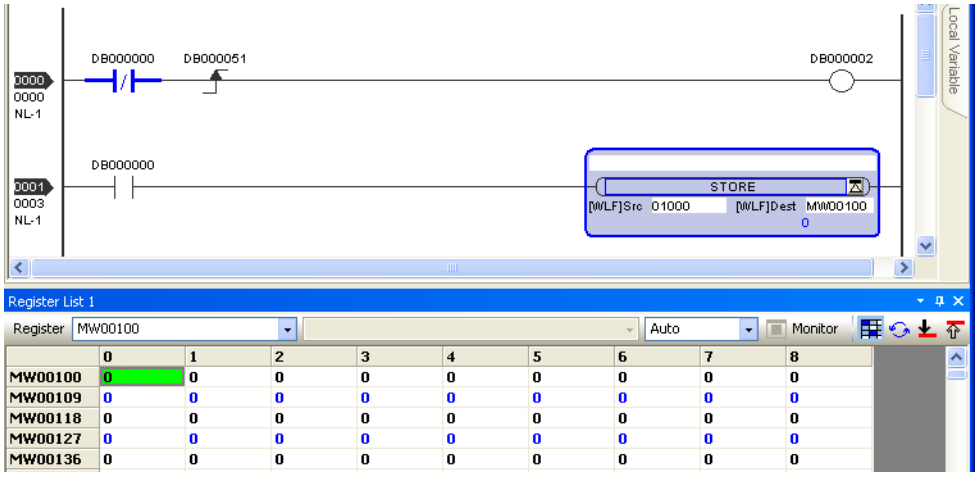


Fig. 6.2 Display Example of Offline Current Value

6.2.5 System Monitor

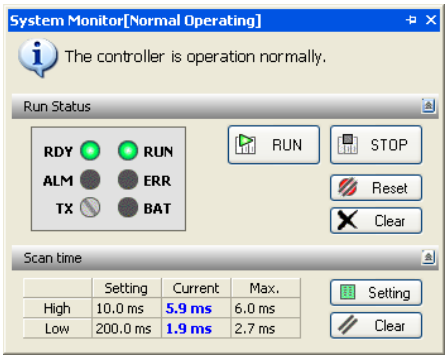
The system monitor function is valid while connected to a Machine Controller (while online). Machine Controller status (LED indicators, CPU status, scan time values) can be monitored in the System Monitor Subwindow. The CPU can be toggled between STOP and RUN, the memory cleared, and errors reset.
The System Monitor Subwindow is automatically displayed as a pop-up when an error is detected.

(1) Using the System Monitor Subwindow

1. Select ***Monitor*** - ***System Monitor*** from the Launcher.

The System Monitor Subwindow title bar will be displayed.

2. Move the mouse pointer to the title bar to display the System Monitor Subwindow.



- The default setting is Automatically Hide Mode. Click the **Automatically Hide** Button in the title bar to convert to a floating window that will not be hidden.

RUN Status Display

This display shows the status of the LED indicators for the Machine Controller.

LED	Contents	Color and Status	Monitor Register
RDY	Machine Controller operating status	Green: Normal Red: Error	SB000400 ON: Normal OFF: Error
RUN	Machine Controller RUN status	Green: Operating Gray: Stopped	SB000401 ON: Operating OFF: Stopped
ALM	Alarm status	Red: Alarm Gray: Normal	SB000402 ON: Alarm OFF: Normal
ERR	Error status	Red: Error Gray: Normal	SB000403 ON: Error OFF: Normal
TX	MECHATROLINK-I/ MECHATROLINK-II data transmission status	Always gray. (Always not communicating.)	---
BAT	Battery alarm status	Red: Battery alarm Gray: Normal	SB000487 ON: Alarm OFF: Normal

RUN and **STOP** Buttons

These buttons change the Machine Controller's CPU status. Their functions are the same as ***CPU RUN*** and ***CPU STOP*** in the Online Menu.

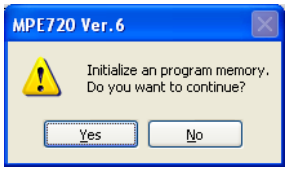
- Refer to *1.10 Stopping (STOP) and Restarting (RUN) the Machine Controller CPU.*

Reset Button

Click the **Reset** Button to clear the Machine Controller error log.

Clear Button

This button clears the contents of the Machine Controller's RAM. When it is clicked, the following message will be displayed for confirmation.



- If program write protection is set to *Write Disable* in the Setup Folder of the **Environment Setting** Dialog Box, connection may not be possible the next time it is attempted. If this occurs, turn the power supply to the Machine Controller OFF and then back ON.

Scan Time Display

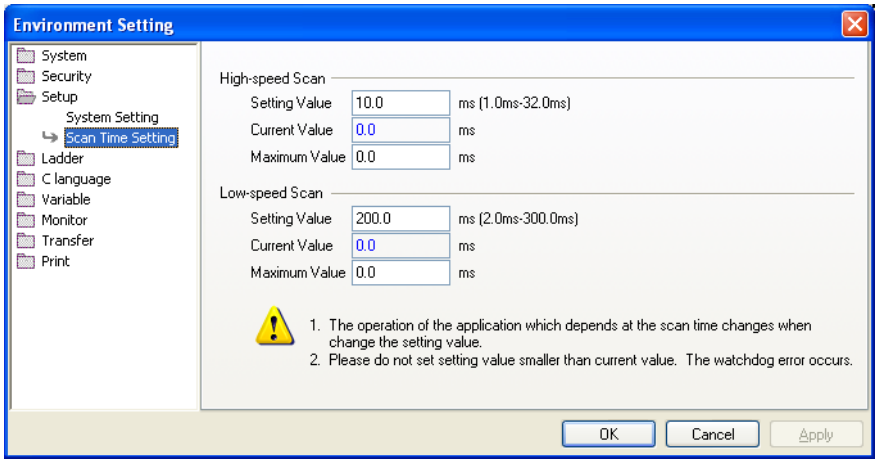
The scan time values are displayed here. If a *Scan Time Over* occurs, it will be displayed in red showing an error.

The *Scan Time Over* occurs if the current value or maximum value exceeds the setting value.

LED	Setting Value	Current Value	Maximum Value
High Speed	Indicator color: Black Monitor register: SW00004	Blue: Within the set range Red: Over the set value Monitor register: SW00005	Black: Within the set range Red: Over the set value Monitor register: SW00006
Low Speed	Indicator color: Black Monitor register: SW00010	Blue: Within the set range Red: Over the set value Monitor register: SW00011	Black: Within the set range Red: Over the set value Monitor register: SW00012

Setting Button

When this button is clicked, the Scan Time Setting screen in the **Environment Setting** Dialog Box is displayed and the scan time can be changed.

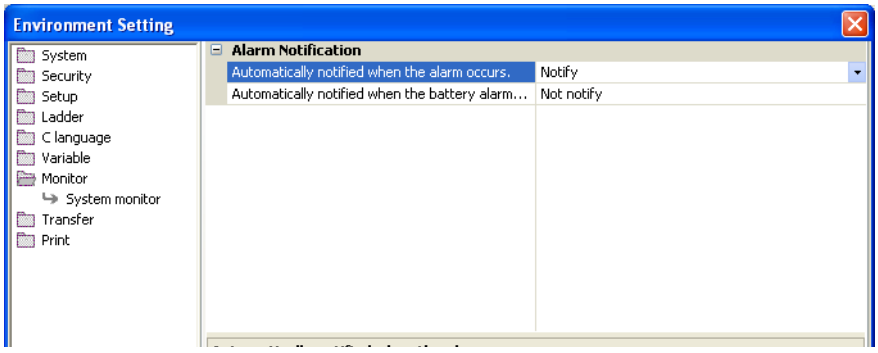


Clear Button

When this button is clicked, the maximum value for the high-speed or low-speed scan is cleared.

(2) Pop-up Display When an Error Is Detected

When automatic notification of alarms is set in the System Monitor screen of the **Environment Setting** Dialog Box (select ***File - Environment Setting*** from the main menu), the System Monitor Subwindow will be displayed automatically when an alarm occurs.



- For details on measures to take when errors are detected, refer to *Chapter 11 Troubleshooting*.

Chapter 7

Data Tracing

This chapter describes data tracing, one of the monitoring functions.

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7.1 Overview of Data Tracing

7.1.1 What is Data Tracing?

Data tracing is one of the MPE720 version 6 monitoring functions. While connected to the Machine Controller (i.e., while online), data tracing can be used to collect Machine Controller I/O data, process it, and display it in graph format. This function can be used for monitoring the operating status of a program or for debugging.

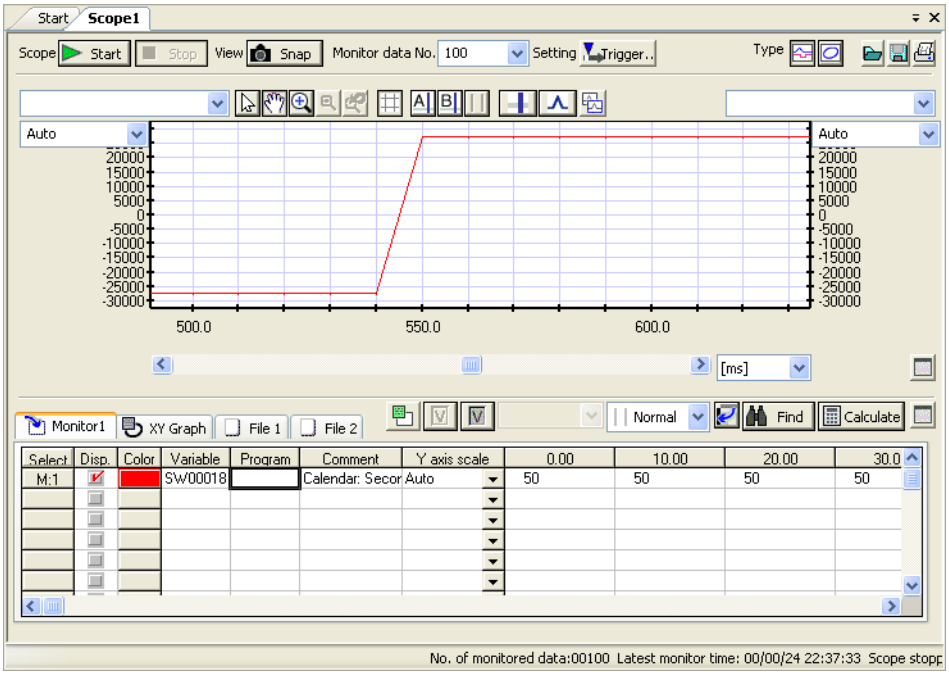


Fig. 7.1 Example of a Graph

7.2 Data Trace Windows

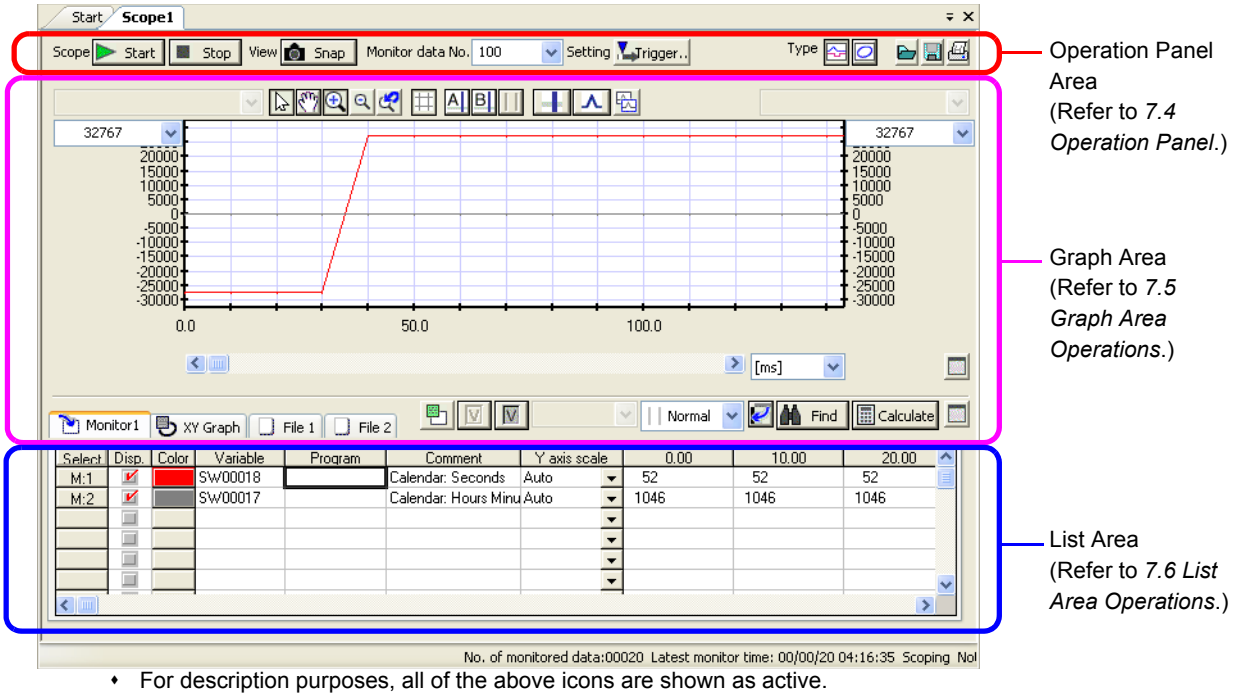
7.2.1 Starting a Data Trace Window

Select ***Monitor*** - ***Scope*** from the Launcher. A **Data Trace** Window will be displayed in the Main Window. With MPE720 version 6, a maximum of four Data Trace Windows can be displayed.

- For details on displaying multiple Data Trace Windows, refer to *7.6.4 Select Monitor Setting Dialog Box*.

7.2.2 Data Trace Window Configuration

A **Data Trace** Window is configured as shown below.



- For description purposes, all of the above icons are shown as active.

- Operation Panel Area

  This area is used for general data trace operations, such as starting and stopping a scope, trigger settings, etc. It is always displayed, regardless of the graph or list display mode. (Refer to *7.4 Operation Panel*.)

- Graph Area

  This area displays trace data. Either a trend graph or an X-Y graph can be selected. The Graph Area is not displayed when the List Area display is maximized. (Refer to *7.5 Graph Area Operations*.)

- List Area

  This area is used for operations such as assigning and deleting Monitor Variables. Monitor Variables are displayed in list format. The List Area is not displayed when the Graph Area display is maximized. (Refer to *7.6 List Area Operations*.)

■ Terminology: Monitor Variables

Variables (registers) that being monitored in graphs or data monitor displays are called Monitor Variables. For a variable (register) to be treated as a Monitor Variable, it must be assigned as one.

- For details on assigning monitor variables, refer to *7.6.8 Assigning Monitor Variables*.

7.3 Displaying Graphs

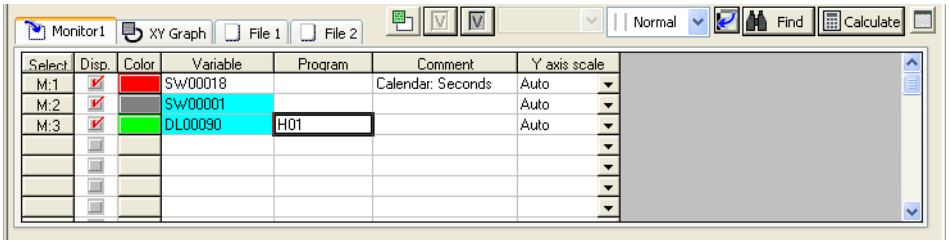
Use the following procedure to display a trend graph or an X-Y graph using the data trace function.

1. Double-click the *Variable* Field in the List Area to display the text cursor, and then enter the register address or variable name to be monitored and press the **Enter** Key.

For a D register, enter the name of the program to be monitored in the *Program* Field.

- Variables can be entered by dragging and dropping from the Variable Subwindow.
- A maximum of 16 register addresses or variables can be entered.

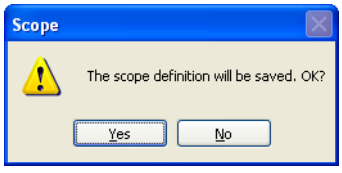
If a comment has been set for a variable that is entered, then the comment will be displayed by entering the variable.



- A blue background for a setting in the *Variable* Field indicates that the setting has not been saved.

2. Select ***File*** - ***Save Setting*** from the Main Menu.

A message asking for confirmation will be displayed.



Click the **Yes** Button. The setting will be saved and the background in the *Variable* Field will return to white.

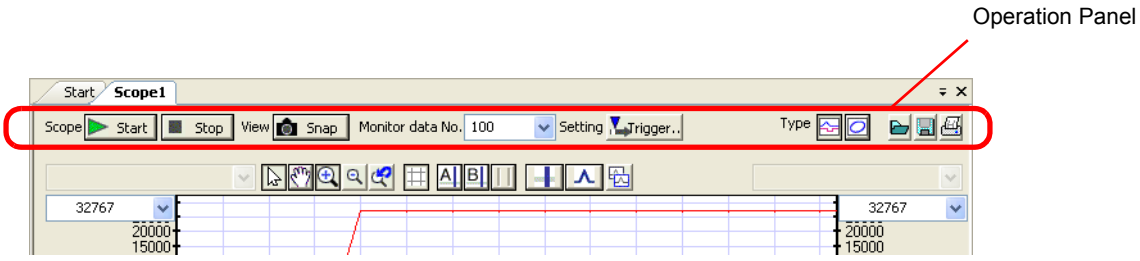
3. Click the **Start** Button (Start) in the Operation Panel to start tracing, and click the **Stop** Button (Stop) to stop. Alternatively, click the **Snap** Button (Snap) to upload the current contents of the trace memory.

A message will be displayed while the data is being obtained, and the graph will be displayed in the Graph Area. The graphs can be toggled between a trend graph and an X-Y graph.

- Detailed settings can be made in the List Area for relevant variables, including not only setting the variables but setting the display colors for graphs and displaying or hiding graphs. For details, refer to *7.6.5 Monitor Pages*.
- The method for displaying graphs can be set in detail in the Graph Area. For details, refer to *7.5 Graph Area Operations*.
- A wide range of data trace operations can be executed using the buttons in the operation panel. For details, refer to *7.4 Operation Panel*.

7.4 Operation Panel

7.4.1 Operation Panel Button Functions



- For description purposes, all of the above icons are shown as active.

The buttons on the operation panel have the following functions.

Start Button (Start)/**Stop** Button (Stop): The **Start** Button and the **Stop** Button are valid only while online.

These buttons start and stop trace operations that record register values with each scan. When one of the buttons is turned ON, the other is automatically turned OFF.

Start - Stop Tracing is being executed. (May be waiting for trigger condition)

Start - Stop Tracing is stopped.

Tracing is started simultaneously when the **Scope** Window is opened, so the **Stop** Button is turned ON when the window is opened.

Snap Button (Snap): The **Snap** Button is valid only while online.

When this button is clicked, a one-time snapshot of the trace data memory is captured and displayed.

Monitor data No. (100)

All data
100
1000

A maximum value can be set for the trace data to be captured when the **Stop** Button or **Snap** Button is clicked. Either select ***All data***, ***100***, or ***1,000***, or click in the cell and directly enter the number.

- The maximum value that can be directly entered is 32,158.

Trigger and Configuration Button (Trigger..)

When this button is clicked, the **Trigger and Configuration** Dialog Box is displayed.

- For details on the **Trigger and Configuration** Dialog Box, refer to *7.4.2 Trigger and Configuration Dialog Box*.

Trend Graph Button ( )

When this button is clicked, a trend graph is displayed.

- For details on the contents of the display and the setting method, refer to *7.5.6 Trend Graphs*.

X-Y Graph Button ( )

When this button is clicked, an XY graph is displayed.

- For details on the contents of the display and the setting method, refer to *7.5.7 X-Y Graphs*.

Import Button ( )

When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be read from selected files to the **Data Trace** Window.

Export Button ( )

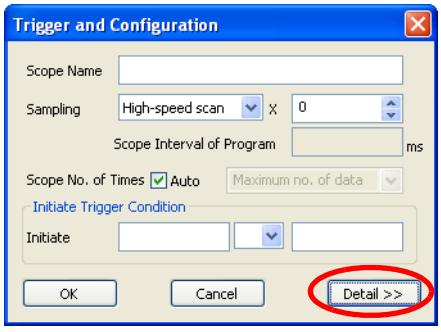
When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be written from the **Data Trace** Window to specified files.

Print Button ( )

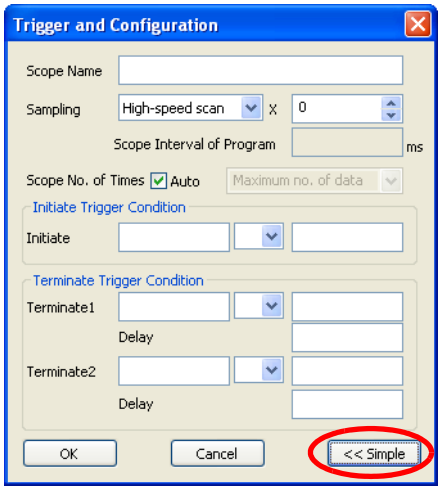
When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be saved to selected files.

7.4.2 Trigger and Configuration Dialog Box

The **Trigger and Configuration** Dialog Box is displayed by clicking the **Trigger and Configuration** Button () on the operation panel.
To toggle between a simple display and a detailed display, click the **Simple** Button or the **Detail** Button.



Simple Display



Detailed Display

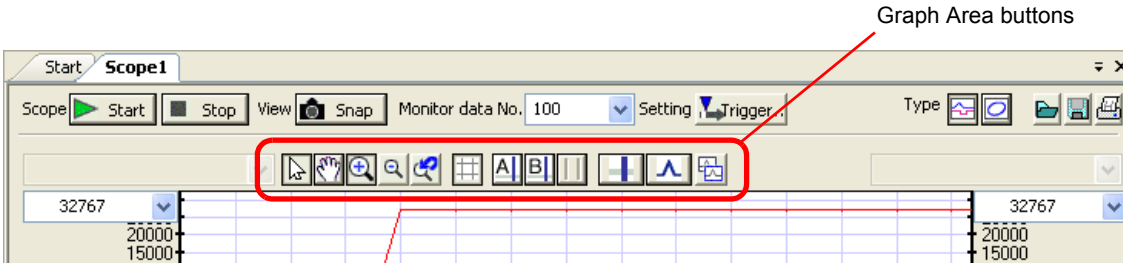
The following table shows each item in the detailed display.

Item	Contents	Set Value
Scope Name	Specifies the name of the condition set that is set in the dialog box. The user can name the scope event.	A maximum of 32 characters can be used.
Sampling	Specifies the data sampling condition. Samples will be taken in line with the selected program.	High-speed scan Low-speed scan Specification by program
Sampling Interval	Specifies the data sampling interval. *When set to 0, tracing is executed each time.	0 to 32,767
Scope Interval of Program	Specifies the time in ms. The value set here is used for the time axis. This setting is valid only when the sampling condition is for specification by program.	0.1 to 999.9
Scope No. of Times	Specifies the number of data traces. When *Auto* is selected, data tracing continues until the stop trigger condition is met or until the **Stop** Button is clicked.	No specification Max. data, 100, 1000 1 to 999,999
Initiate Trigger Condition	Specifies the register number, logical operator, and number to serve as the trigger for initiating the trace operation. If nothing is specified, tracing will start at the same time as sampling starts.	Register number > / < / = / < > / >= / <= Number
Terminate Trigger Conditions 1 and 2 (Not shown for simple display.)	Specifies the register number, logical operator, and number to serve as the trigger for terminating the trace operation. One or two terminate triggers can be set. If nothing is specified, tracing will be executed until sampling stops.	Register number > / < / = / < > / >= / <= Number
Number of Terminate Delays (Not shown for simple display.)	Specifies how many times sampling is to be executed and tracing terminated after the termination condition is met.	0 to 65,534

7.5 Graph Area Operations

7.5.1 Functions of Buttons in Graph Area

The Graph Area buttons are used for common functions in the Trend Graph Mode and the X-Y Graph Mode.



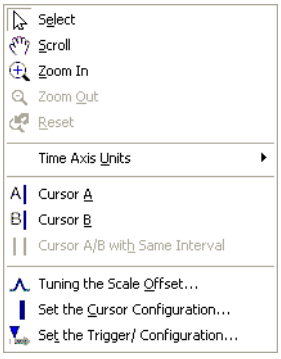
- For description purposes, all of the above icons are shown as active.

The following table shows the functions of the Graph Area buttons.

	Icon	Name	Contents
Cursor settings		Select	When this icon is clicked, the cursor turns into an offset adjustment cursor for the Graph Area and the graph can be scrolled vertically by dragging. • Graph Areas for which *Auto* is selected from the list as the maximum vertical axis value cannot be moved.
		Scroll	Turns the cursor into a graph scroll cursor so that the graph can be scrolled horizontally by dragging.
		Zoom In	Turns the cursor into the graph zoom-in cursor to enable enlarging areas by selecting them with the cursor.
		Zoom Out	After using zoom-in to get a close up view, gradually reduces the size of the image being displayed. • This icon is available.
		Reset	Returns the graph to its original scale. • This icon is available.
		Grid	Toggles between displaying and hiding the grid.
Cursor operations		Cursor A	Toggles between displaying and hiding cursor A, one of the two cursor types (A and B).
		Cursor B	Toggles between displaying and hiding cursor B, one of the two cursor types (A and B).
		Cursor A/B with Same Interval	Links cursors A and B to operate at a fixed interval. • This icon is active when both cursors A and B are displayed.
		Cursor Setting	Displays the **Cursor Setting** Dialog Box. • Refer to *7.5.4 Cursor Setting Dialog Box*.
		Adjust Scale/ Offset	Displays the **Scale Offset Adjust** Dialog Box. • Refer to *7.5.5 Scale Offset Adjust Dialog Box*.
		Copy Graph	Copies the graph to the clipboard. • Copied images of graphs can be pasted in other Windows applications.
		Maximum Graph Display	Hides the list and maximizes the graph display. • This icon is active only during normal graph display.
		Normal Graph Display	Displays the list and returns the graph to its normal display. • This icon is active only during maximum graph display.

7.5.2 Graph Area Pop-up Menu

The following pop-up menu is displayed by right-clicking in the Graph Area.



The items in the pop-up menu can perform the same operations as the buttons in the Graph Area. For details, refer to *7.5.1 Functions of Buttons in Graph Area*.

7.5.3 Using Mouse Cursors

There are two types of cursor (A and B) in the Graph Area. They can be used either individually or together.

- For details on displaying, hiding, and linking cursors A and B, refer to *7.5.1 Functions of Buttons in Graph Area*.

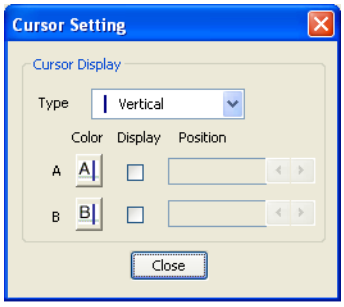
Left-clicking within a graph will cause the cursor to move as described below, depending on the circumstances.

- When Only Cursor A (or Cursor B) Is Displayed
  Cursor A (or cursor B) will move to the location that was clicked.
- When Cursors A and B Are Both Displayed and Linked
  Cursor A will move to the location that was clicked and cursor B will move with it at a fixed interval.
- When Cursors A and B Are Both Displayed but Not Linked (See note.)
  When the cursor mode in the List Area is set to either *Normal* or *Cursor A*, cursor A will move to the location that was clicked. Cursor B will not move.
  When the cursor mode in the List Area is set to *Cursor B*, cursor B will move to the location that was clicked. Cursor A will not move.

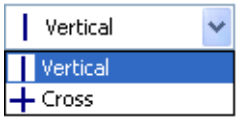
  Note: When *Cursor A/B with Same Interval* is not selected, *Normal* cannot be selected as the cursor mode in the List Area. Conversely, when *Cursor A/B with Same Interval* is selected, neither *Cursor A* nor *Cursor B* can be selected as the cursor mode in the List Area.

7.5.4 Cursor Setting Dialog Box

When the **Cursor Setting** Button () in the Graph Area is clicked, the **Cursor Setting** Dialog Box will be displayed as shown below.

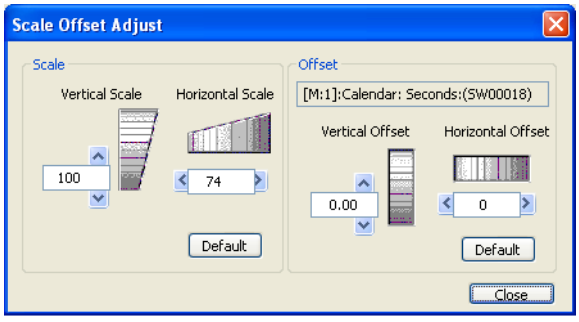


The following table shows the items to be set in the **Cursor Setting** Dialog Box.

Icon	Name	Contents	Remarks
	Type	Used to select either *Vertical* (|) or *Cross* (+) cursor shape.	The cross cursor is displayed when a Monitor Variable is activated in the *Select Field* of the list display. The center of the cross cursor will move over the selected Monitor Variable.
	Color	Used to select the cursor A and B colors.	When the icon is clicked, the **Color Setting** Window will be displayed.
	Display	Used to toggle between displaying and hiding the A and B cursors.	The cursors are displayed by selecting their respective checkboxes.
	Position	Used to adjust the cursor display position. Enter a value directly or use the spin buttons.	When a number is entered directly, it is adjusted to the nearest grid position.

7.5.5 Scale Offset Adjust Dialog Box

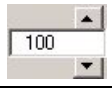
When the Adjust Scale/Offset Button ( ) in the Graph Area is clicked, the **Scale Offset Adjust** Dialog Box will be displayed as shown below. This dialog box can be used to adjust the scale (maximum value) for each axis of the graph and to adjust the offset (deviation from the center).



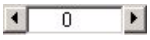
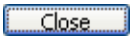
There is no need to select the object for scale adjustment. Offset adjustment is valid when an offset adjustment object is selected in the *Select* Field of the list. (See note.) Offset adjustment cannot be used without selecting an object. It also cannot be used if the selection is cleared after the dialog box is displayed. If that occurs, it can be used by selecting an offset adjustment object from the list to activate it.

Note: Use the *Select* Field in the list to select the offset adjustment object. On Monitor Pages and File Pages, the selected object will be a Monitor Variable. The offset adjustment horizontal axis will be the sampling time, and the vertical axis will be the data value of the selected Monitor Variable. On an X-Y Display Page, the Monitor Variables set for the vertical and horizontal axes become the objects. The offset adjustment horizontal and vertical axes will be the data values for the variables that are set. For details on pages, refer to *7.6.1 Changing Pages*.

The following table shows the items to be set in the **Scale Object Adjust** Dialog Box.

Icon	Name	Contents	Remarks
	Vertical Scale Set Value	Used to set the vertical scale. Enter a value directly or use the spin buttons.	Input range: 100 to 1,000
	Vertical Scale Adjustment Bar	Used to adjust the vertical scale. Drag up and down using the mouse.	–
	Horizontal Scale Set Value	Used to set the horizontal scale. Enter a value directly or use the spin buttons.	Input range: 10 to 1,000
	Horizontal Scale Adjust-ment Bar	Used to adjust the horizontal scale. Drag up and down using the mouse.	–
	Offset Adjust-ment Variable	The variable name for the offset adjustment object is displayed.	–
	Vertical Offset Position Set Value	Used to set the vertical offset position. Enter a value directly or use the spin buttons.	Input range: -100.00 to 100.00
	Vertical Offset Adjustment Bar	Used to adjust the vertical offset posi-tion. Drag up and down using the mouse.	–

(cont'd)

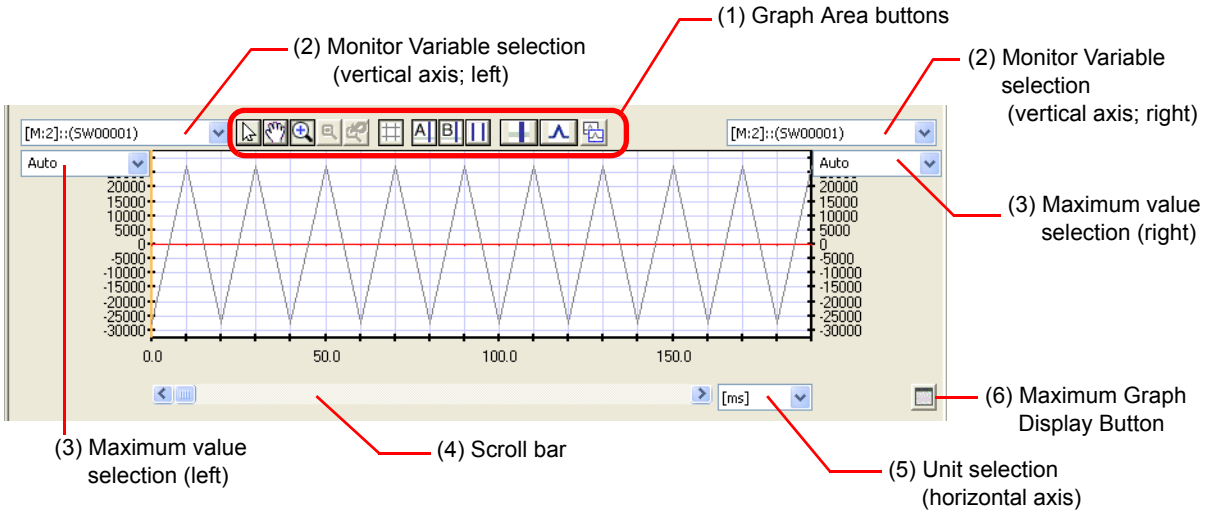
Icon	Name	Contents	Remarks
	Horizontal Offset Position Set Value	Used to set the horizontal offset position. Enter a value directly or use the spin buttons.	Input range: When the object (sampling time) is selected at a Monitor Page or File Page: -99 to 99 When the object (variable value) is selected at an X-Y Display Page: -100.00 to 100.00
	Horizontal Offset Adjustment Bar	Used to adjust the horizontal offset position. Drag up and down using the mouse.	–
	Default	Used to return the scale or offset to their default values. Vertical scale: 100 Horizontal scale: 100 Vertical offset: 0.00 Horizontal offset: 0	The default value for the horizontal offset is 0.00 when an object is selected at an X-Y Display Page.
	Close	Used to close the **Scale Offset Adjust** Window.	–

7.5.6 Trend Graphs

When the Trend Graph Button ( ) in the operation panel is clicked, the Graph Area will change to the Trend Graph Mode.
In Trend Graph Mode, Monitor Variables (register values) that have been set are displayed in graph format in a time sequence.
Operations such as pointer settings, cursor settings, scale adjustments, and graph copying can be performed in this mode. Operations in Trend Graph Mode are described in detail below.

(1) Operations in Trend Graph Mode

The configuration elements of the graph in Trend Graph Mode are described below.



(1) Graph Area Buttons

The Graph Area buttons are used in both the Trend Graph Mode and the X-Y Graph Mode. They can be used for operations such as setting or changing pointers and cursors or switching the graph display.

- For details on the Graph Area buttons, refer to *7.5.1 Functions of Buttons in Graph Area*.

(2) Monitor Variable Selection (Left, Right)

Variable names and maximum values (units) can be set separately for the left and right vertical axes in a trend graph.
Clicking the drop-down arrow will display in a list all of the variables for which the display is set to ON in the List Area. Select the variables to be set for the left and right vertical axes.

(3) Maximum Value Selection (Left, Right)

The Maximum Value Selection is used to set the maximum values for the left and right vertical axes (Monitor Variables). The values can be directly entered by double-clicking the cells. When ***Auto*** is selected, maximum values are adjusted so that all of the trace data that is obtained will be displayed in the Graph Area.

(4) Scroll Bar

The section to be monitored can be moved by either dragging the slide bar or clicking the right or left arrows.

(5) Unit Selection

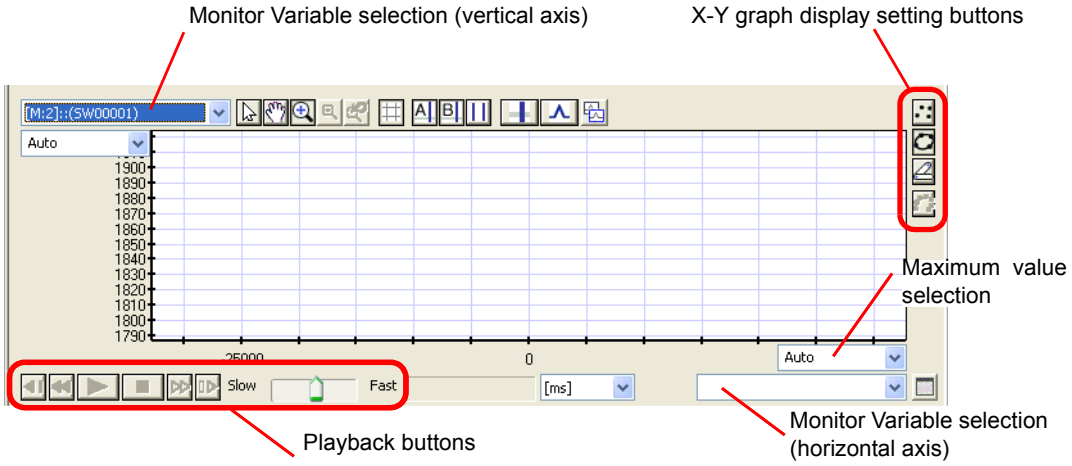
The display unit for the horizontal axis (time axis) can be set to data, ms, sec, or min.

(6) Maximum Display Button ( ) and Normal Display Button ( )

When the **Maximum Display** Button is clicked, the List Area is hidden, the Graph Area is maximized, and the **Normal Display** Button is displayed. When the **Normal Display** Button is clicked, the Graph Area is returned to its original size and the List Area is displayed.

7.5.7 X-Y Graphs

An X-Y graph takes two specified Monitor Variables (variable X and variable Y) in the horizontal and vertical axes, and shows their relationship over a given time.



Variable names and maximum values can be set for the horizontal and vertical axes of X-Y graphs in the same way as for the vertical axes of trend graphs. While an X-Y graph is displayed, display settings and playback operations are enabled in addition to all of the operations for a trend graph.

(1) X-Y Graph Display Display Setting Buttons

The display settings for an X-Y graph can be changed.

Icon	Name	Contents
	Point Display	Used to display coordinates as points.
	Line Display	Used to display coordinates connected by lines.
	Model Display	Used to display coordinates connected by lines according to connected-point data. • For details on connected points, refer to *Connection Point* in *7.6.6 X-Y Display Page*.
	Tracks	Used to select whether or not to leave tracks. • Active for point display only.

(2) Playback Operations

The playback function reproduces displays of data captured before tracing is stopped, or data captured for snapshots. Operations such as playback, stop, forward, return, slow-motion forward, and slow-motion return can be performed. Playback can be executed when an X-Y graph is displayed. There is no time information included in an X-Y graph, so this function is provided to display changes in data with the elapsed time.

The following table shows the playback-related buttons.

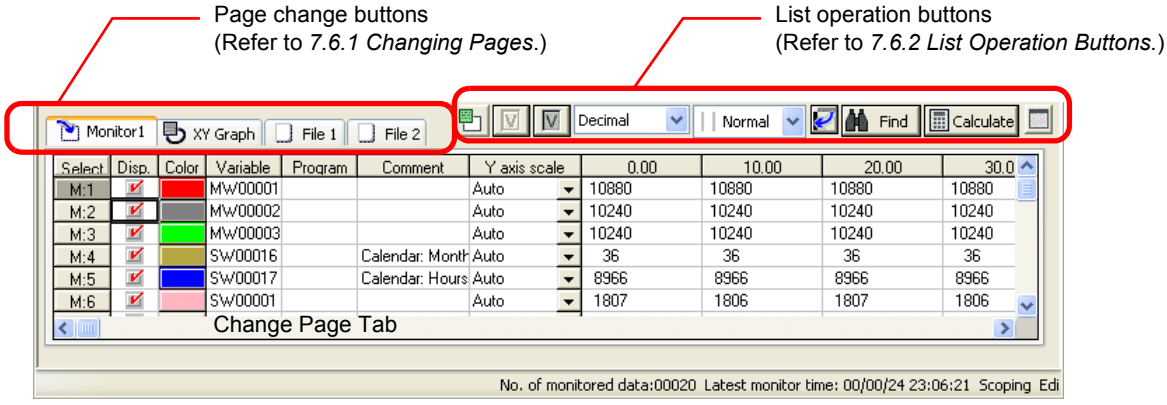
Icon	Name	Contents
	Playback	Replays an X-Y graph from the beginning of the traced data.
	Stop	The replaying of an X-Y graph is stopped at the point where this button is clicked.
	Fast Forward/Return	Executes fast forward or return at the specified rate. When these buttons are cleared, playback is automatically resumed. • Can be used only during playback.
	Slow-motion Forward/ Slow-motion Return	Executes slow-motion forward or return.
–	Return to Beginning	Select ***XY Graph*** - ***Return to Beginning*** from the Main Menu. The beginning of the traced data will be returned to.
–	Forward to End	Select ***XY Graph*** - ***Forward to End*** from the Main Menu. The end of the traced data will be forward to.
	Rate Setting	Sets the forward and return rate.
	Execution Time	Displays the execution time for the playback display. The unit can be set to ms, sec, min, or data.

7.6 List Area Operations

The following operations can be executed in the List Area: monitor setting, variable selection, object variable setting, data display setting, cursor mode, list vertical/horizontal display switching, searching, calculations, and maximum list display. These operations can be executed in any mode, regardless of the list display mode (page).

- For details on assigning Monitor Variables, refer to *7.6.8 Assigning Monitor Variables*.

An example of List Area display and configuration is shown below.



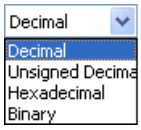
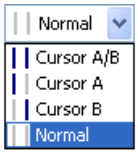
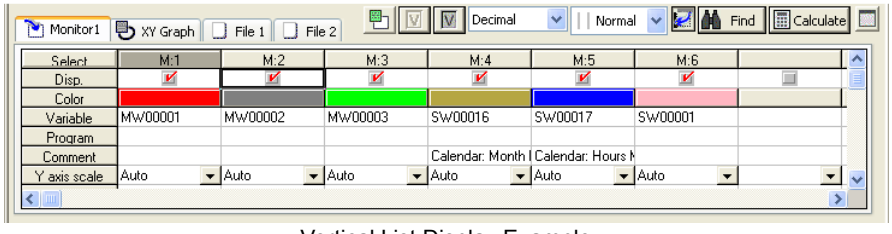
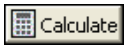
7.6.1 Changing Pages

Click the **Change Page** Tab to change the page.
The following three types of pages are displayed in the List Area.

- Monitor Pages (Refer to *7.6.5 Monitor Pages*.)
- X-Y Display Pages (Refer to *7.6.6 X-Y Display Page*.)
- File Pages (Refer to *7.6.7 File Pages*.)

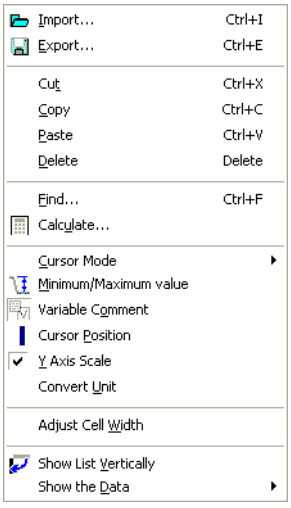
7.6.2 List Operation Buttons

The following table provides details on the list operation buttons.

Icon	Name	Contents
	Monitor Setting	Displays the Select **Monitor Setting** Dialog Box so that the number of **Data Trace** Windows can be set. • Refer to *7.6.4 Select Monitor Setting Dialog Box*.
	Object Variable Setting	Displays the **Object Variable Setting** Dialog Box so that the variables used by imported files can be registered as Monitor Page variables (monitor variables). • Refer to *7.6.9 Object Variable Setting Dialog Box.*
	Data Display	Changes the data display type for variables selected from the list. Decimal, unsigned decimal, hexadecimal, or binary can be selected. • The data display selection is invalid when no variables are selected.
	Cursor Mode	Selects *Cursor A/B*, *Cursor A*, *Cursor B*, and *Normal* for the cursors linked to data display positions. When *Cursor A*, *Cursor B*, or *Cursor A/B* is selected, the cursor position on the graph is linked with the data position displayed on the Monitor Page and File Page of the List Area. • When cursor A (or cursor B) is not displayed, *Cursor A (B)* cannot be selected. When *Cursor A/B with Same Interval* is not set in the Graph Area, *Cursor A/B* cannot be selected. • The status will not change if disabled selections are selected.
	List Display Direction	Toggles the list display direction between vertical and horizontal. When OFF, all variable data is displayed in the horizontal direction. When ON, all variable data is displayed in the vertical direction.
		 Vertical List Display Example
	Find	When this button is clicked with a Monitor Variable in the list selected, the **Find** Dialog Box is displayed and the graph maximum value, minimum value, local maximum value, local minimum value, and time axis can be found. • Refer to *7.6.10 Find Dialog Box*.
	Calculate	When this button is clicked with a Monitor Variable in the list selected, the **Calculate** Dialog Box is displayed and the area, average, and absolute average calculation results can be referenced for the selected variable. • Refer to *7.6.11 Calculate Dialog Box*.
	Maximum List Display	Hides the graph and maximizes the list display. • This icon is active only during normal list display.
	Normal List Display	Clears the maximum list display and returns to the normal display (graph and list). • This icon is active only during maximum list display.

7.6.3 Pop-up Menu

The following pop-up menu is displayed by right-clicking in the List Area.

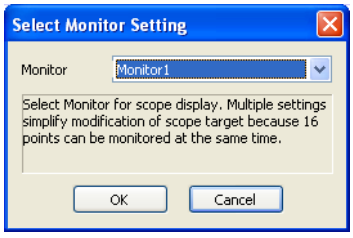


The following table list the operations in the above pop-up menu that cannot be executed using the list buttons.

Icon	Menu Item	Content
	Maximum/Minimum value (M)	Toggles between displaying and hiding the maximum and minimum values in the List Area. • This operation is the same as selecting ***Display*** - ***Maximum/Minimum Value*** from the Main Menu. For details, refer to *7.6.5 Monitor Pages*.
	Variable Comment (O)	Toggles between displaying and hiding variable comments in the List Area.
	Cursor Position (P)	Toggles between displaying and hiding *Cursor A*, *Cursor B*, and *Difference A-B* in the List Area. • This operation is the same as selecting ***Display*** - ***Cursor Position*** from the Main Menu. For details, refer to *7.6.5 Monitor Pages*.
–	Convert Unit (U)	Toggles between displaying and hiding *Convert Unit* in the List Area. • This operation is the same as selecting ***Display*** - ***Convert Unit*** from the Main Menu. For details, refer to *Convert Unit (xN) 7.6.5 Monitor Pages*.
–	Adjust Cell Width (W)	Adjusts the width of cells in the List Area to the width of the cell where the cursor is located.

7.6.4 Select Monitor Setting Dialog Box

The **Select Monitor Setting** Dialog Box is displayed by clicking the **Monitor Setting** Button (). The **Data Trace** Window displayed in the **Main** Window can be selected from ***Monitor 1*** to ***Monitor 4***.
The default setting is for only ***Monitor 1*** to be displayed. For example, selecting ***Monitor 3*** and clicking the **OK** Button will cause ***Monitor 1*** and ***Monitor 3*** to be displayed in the **Main** Window.
A maximum of 16 Monitor Variables can be assigned on a single **Data Trace** Window (**Monitor** Window). The number of objects monitored can be expanded by setting multiple Monitor screens, and the objects can be easily displayed by switching among the Monitor screens.

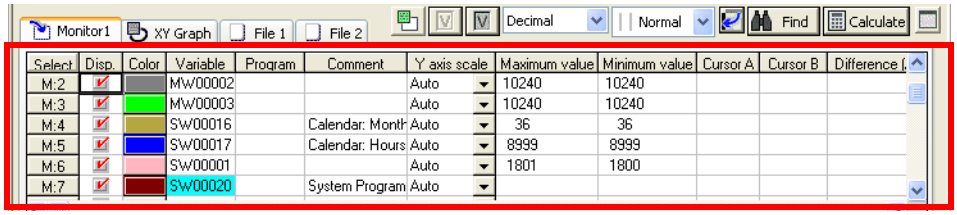

Select Monitor Setting
Monitor
Monitor1
Select Monitor for scope display. Multiple settings simplify modification of scope target because 16 points can be monitored at the same time.
OK
Cancel

7.6.5 Monitor Pages

Monitor Variables can be displayed, assigned, deleted, and edited at a Monitor Page.

- For details on assigning and editing Monitor Variables, refer to *7.6.8 Assigning Monitor Variables*.

The following table describes the items in a Monitor Page display, using the illustration below as an example.

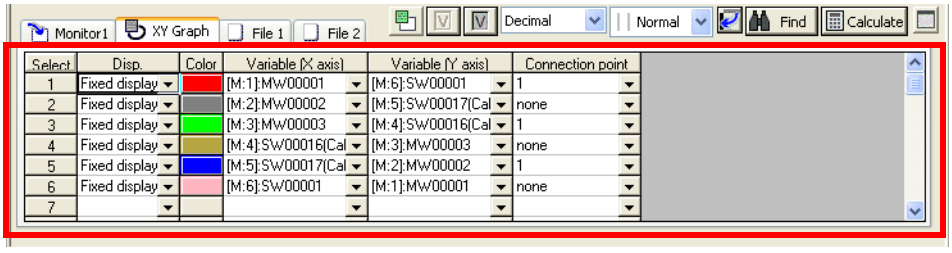


Item	Contents
Select	Selects the Monitor Variable that is to be edited. It is possible to view different data displays, search, calculate, perform offset adjustments, and change the cursor to a cross. The following items are displayed. M:y: Number y of monitor Fx:y: Number y of file "x" SUB: Difference between two variables ADD: Sum of two variables REF: Reference variable
Display	Toggles between displaying ( ) and hiding ( ) a graph for a given variable.
Color	Selects the color for a graph. The **Select Color** Dialog Box is displayed by double-clicking a cell. The color can then be selected and set.
Variable	Used to enter the variable name or register address for the trace object. • Variables can be entered by dragging and dropping from the Variable Subwindow. • A maximum of 16 register addresses or variables can be entered.
Program	For a D register, enter the name of the program in which the D register is used.
Comment	Comments are displayed (display only).
Y axis scale	Selects one of the following as the Y-axis scale: *Auto*, *Y1 Axis*, or *Y2 Axis*. When *Auto* is set, the scale is automatically adjusted and displayed for each Monitor Variable. When *Y1 Axis* is selected, the scale data is displayed at the left side of the graph; and when *Y2 Axis* is selected, the scale data is displayed at the right side of the graph.
Maximum value (See note.)	Displayed by selecting ***List - Maximum/Minimum Value*** from the Main Menu. Maximum values for trace data are displayed (display only).
Minimum value (See note.)	Displayed by selecting ***List - Maximum/Minimum Value*** from the Main Menu. Minimum values for trace data are displayed (display only).
Cursor A (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. Values for cursor A are displayed (display only).
Cursor B (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. Values for cursor B are displayed (display only).
Difference (A-B) (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. The difference between the values for cursors A and B is displayed (display only).
Convert Unit (xN) (See note.)	Displayed by selecting ***List - Convert Unit*** from the Main Menu. Sets values with a multiplication factor for unit conversion. Variable values: The product of the two values is displayed. Set for operations such as replacing machine coordinate systems.

Note: The *Maximum values* and *Minimum values*, *Cursors A and B*, *Difference (A-B)*, and *Unit Conversion (xN)* are not displayed by default. If they do not appear in the List Area when they are displayed from the Main Menu, then display them by reducing the cell widths.

7.6.6 X-Y Display Page

In the X-Y Display Page, the Monitor Variables used for displaying an X-Y graph as the graph can be assigned, deleted, edited, and displayed. The List Area appears as shown below when the X-Y Display Page is displayed.



The following table shows the items in the X-Y Display Page.

Item	Contents
Select	Selects the object to be activated. Once the object is activated, then the object can be adjusted and the cross cursor can be displayed.
Display	Selects one of the following as the method for display the graph: *hidden, fixed display,* or *playback*. *Hidden*: Data is not displayed on a graph. *Fixed display*: Data is displayed on a graph when tracing is executed. *Playback*: data is displayed on a graph when playback is executed.
Color	Selects the color for a graph. The **Select Color** Dialog Box is displayed by double-clicking a cell. The color can then be selected and set.
Variable (X Axis)	Specifies the name of a variable to be traced on the X axis (the horizontal axis). The variable name can be selected from the variables set on the Monitor Page.
Variable (Y Axis)	Specifies the name of a variable to be traced on the Y axis (the vertical axis). The variable name can be selected from the variables set on the Monitor Page.
Connection Point	Sets the number in the model display to which to connect. Either *Nothing* or the *Select* number set for the X-Y page can be selected.
Cursor A (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. Values for cursor A are displayed (display only).
Cursor B (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. Values for cursor B are displayed (display only).
Difference (A-B) (See note.)	Displayed by selecting ***List - Cursor Position*** from the Main Menu. The difference between the values for cursors A and B is displayed (display only).

Note: The *Cursor A*, *Cursor B*, and *Difference (A-B)* are not displayed by default. If they do not appear in the List Area, then display them by reducing the cell widths.

7.6.7 File Pages

Monitor Variable data imported from specified files (CSV files) can be displayed in File Pages.
Use the following procedure to import the data.

1. Click the **File** Tab in the List Area to display a File Page.
2. Select ***File*** - ***Import*** from the Main Menu.

   The **Open File** Dialog Box will be displayed.
3. Select the file (.csv) from which to import data, and click the **Open** Button.

   The data in the selected file will be displayed.

The items displayed on a File Page are the same as those on a Monitor Page. Variables, programs, and comments depend on data imported from files, so they cannot be edited.
The default setting for the number of File Pages displayed is two, but the number can be set for a maximum of eight.

- Variables displayed on a File Page can be assigned as Monitor Variables, to be monitored on a Monitor Page. For details, refer to *7.6.9 Object Variable Setting Dialog Box*.
- For details on setting the number of File Pages displayed, refer to *7.7.3 (4) Setting the List Tab Page*.

7.6.8 Assigning Monitor Variables

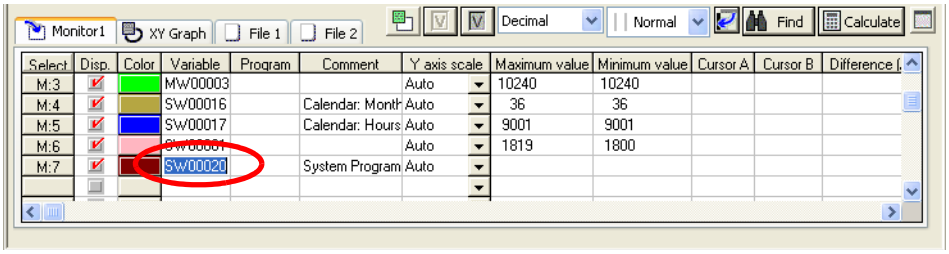
The data trace function can be used by assigning the variables that are to be monitored (i.e., the Monitor Variables) in the List Area. A maximum of 16 Monitor Variables can be assigned.

- Up to 64 (16 x 4) Monitor Variables can be assigned by changing the monitor setting. Only 16 Monitor Variables, however, can be displayed at one time. Refer to *7.6.4 Select Monitor Setting Dialog Box*.

The following methods can be used to assign Monitor Variables from the **Data Trace** Window.

■ Entering the Variable Name (Register) to the *Variable* Cell in a Monitor Page

Double-click the cell to enter the input mode. The variable name (register address) can either be directly entered or it can be entered by dragging and dropping from the Variable Subwindow.



■ Assigning Variables from the Ladder Program Edit Window

Right-click a variable object in the **Ladder Program Edit** Window and select ***Add to Scope*** from the pop-up menu. The variable will be assigned as a trace data variable.

■ Deleting Variables from the List (1)

In a Monitor Page or X-Y Display Page, right-click the variable to be deleted and select ***Delete*** from the pop-up menu. Alternatively, select ***Edit*** - ***Delete*** from the Main Menu.
The selected variable will be deleted from the list, and that row will be left empty.

■ Deleting Variables from the List (2)

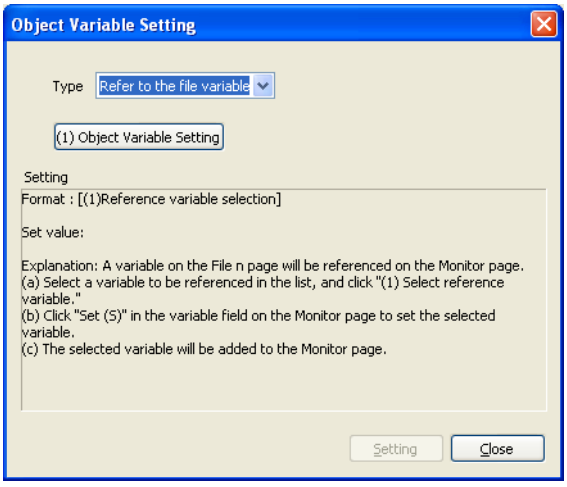
In the Monitor Page, select the variable to be deleted, and then select ***Edit*** - ***Delete Record*** from the Main Menu. The selected variable row will be deleted.

■ Inserting an Empty Row

In the Monitor Page, select the variable above which the row is to be inserted, and then select ***Edit*** - ***Insert Record*** from the Main Menu. The empty row will be inserted above the selected variable.

7.6.9 Object Variable Setting Dialog Box

The **Object Variable Setting** Dialog Box shown below is displayed by clicking the **Object Variable Setting** Button ( ). With this dialog box, variables displayed on a File Page can be assigned to a Monitor Page as Monitor Variables.


Object Variable Setting
Type
Refer to the file variable
(1) Object Variable Setting
Setting
Format : [(1)Reference variable selection]
Set value:
Explanation: A variable on the File n page will be referenced on the Monitor page.
(a) Select a variable to be referenced in the list, and click "(1) Select reference variable."
(b) Click "Set (S)" in the variable field on the Monitor page to set the selected variable.
(c) The selected variable will be added to the Monitor page.
Setting
Close

Use the following procedure to set a reference variable.

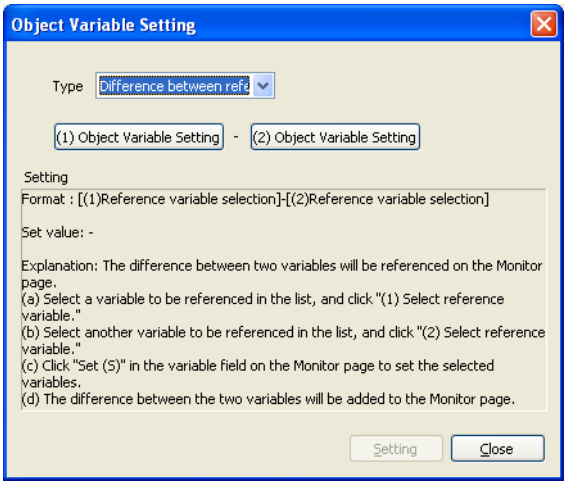
1. With the above dialog box displayed, select the variable to be referenced from the list and click the **(1) Object Variable Setting** Button.

   The selected variable name will be displayed in the *Set value* area.

2. Select the variable field on the Monitor Page that is to be set from the list, and click the **Setting** Button in the **Object Variable Setting** Dialog Box.

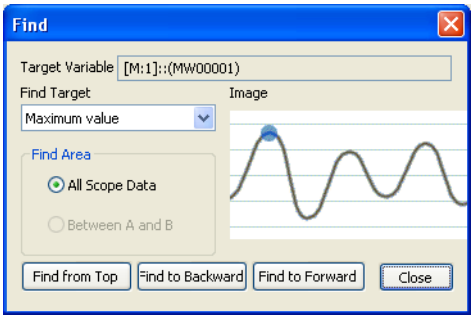
   The selected reference variable will be added to the selected variable field.

Not only file variable, but reference variable difference or sum can be selected as the reference variable type. When *Difference between reference variables* is selected as the type, the **Object Variable Setting** Dialog Box will appear as shown below. It will be similar when *Sum of reference variables* is selected.

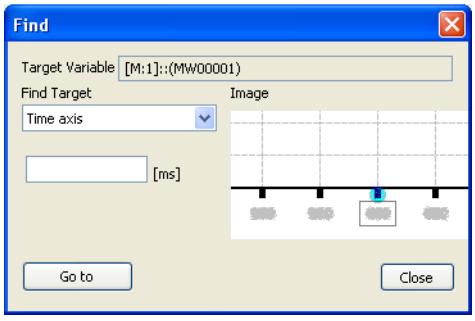

Object Variable Setting
Type
Difference between refe
(1) Object Variable Setting
-
(2) Object Variable Setting
Setting
Format : [(1)Reference variable selection]-[(2)Reference variable selection]
Set value: -
Explanation: The difference between two variables will be referenced on the Monitor page.
(a) Select a variable to be referenced in the list, and click "(1) Select reference variable."
(b) Select another variable to be referenced in the list, and click "(2) Select reference variable."
(c) Click "Set (S)" in the variable field on the Monitor page to set the selected variables.
(d) The difference between the two variables will be added to the Monitor page.
Setting
Close

7.6.10 Find Dialog Box

With a Monitor Variable selected in the list, click the **Find** Button (Find). The **Find** Dialog Box will be displayed, and the maximum value, minimum value, local maximum value, local minimum value, and time axis can be found for the selected variable.

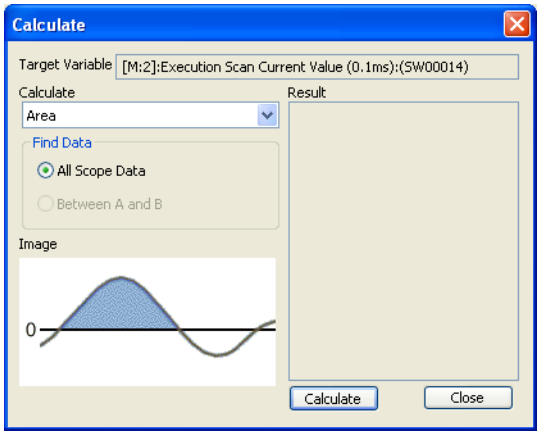


The following operations can be executed in the **Find** Dialog Box.

Icon	Name	Contents
[M:1]::(MW00001)	Target Variable	Displays the variable name that is to be found.
Maximum value Maximum value Minimum value Local maximum value Local minimum value Time axis	Find Target	Selects one of the following as the find object: *Maximum value*, *Minimum value*, *Local maximum value*, *Local minimum value*, and *Time axis*. When *time axis* is selected, the dialog box will appear as shown below.  Display Example: When *Time Axis* is Selected
Find Area All Scope Data Between A and B	Find Area	Selects either *All Scope Data* or *Between A and B* as the find area. • *Between A and B* cannot be selected when cursors A and B are hidden.
Find from Top	Find from Top	Searches from the top of the find area.
Find to Backward	Find to Backward	Searches backward from the present position.
Find to Forward	Find to Forward	Searches forward from the present position.
Close	Close	Closes the **Find** Dialog Box.
[ms]	Time Setting	Sets the search time in units of ms. • Displayed only when *time axis* is set as the find target.
Go to	Go To	Jumps to the data for the set time (proximity). • Displayed only when *time axis* is set as the find target.

7.6.11 Calculate Dialog Box

With a Monitor Variable selected in the list, click the **Calculate** Button (Calculate). The **Calculate** Dialog Box will be displayed, and the area, average, and absolute average calculation results for the selected variable can be referenced.



The following operations can be executed in the **Calculate** Dialog Box.

Icon	Name	Contents
[M:1]:(MW00001)	Target Variable	Displays the variable name for which a calculation is to be performed.
Area Area Average Absolute average	Calculation Type	Selects one of the following as the calculation type: *Area*, *Average*, or *Absolute average*.
Find Data All Scope Data Between A and B	Find Area	Selects either *All Scope Data* or *Between A and B* as the find area. • *Between A and B* cannot be selected when cursors A and B are hidden.
Calculate	Calculate	Executes the calculation. The result is displayed in the *Result* area.
Close	Close	Closes the **Calculate** Dialog Box.

7.7 Other Functions

This section describes other functions, including saving and deleting trace definition data, setting defaults, printing, and making optional settings.

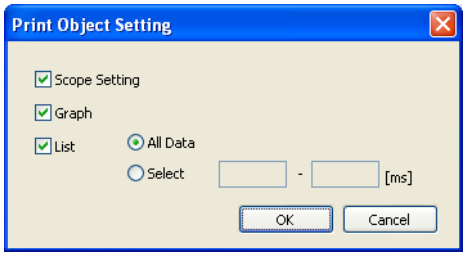
7.7.1 Saving and Deleting Trace Definition Data and Setting Defaults

Operations such as saving and deleting Trace Definitions can be executed from the File Menu.

Item	Operation	Contents	Remarks
Default Setting	File (F) → Set to Default (F)	Returns the Trace Definitions to the default status.	All Monitor Variables that have been assigned will be deleted.
Save Settings	File (F) → Save Settings (S)	Saves the Trace Definitions.	–
Delete Settings	File (F) → Delete Settings (D)	Deletes the Trace Definitions.	–

7.7.2 Print Settings

Data Trace Definitions, graphs, and lists can be printed using the following procedure. Select ***File - Print Object Setting*** from the Main Menu. The **Print Object Setting** Dialog Box will be displayed. Check the items to be printed, and click the **OK** Button.



- Items which are set in the **Print** Tab Page of the **Option** Dialog Box to not be printed become inactive in the display. For details, refer to *7.7.3 (5) Setting the Print Tab Page*.

Select ***File - Print*** from the Main Menu to execute printing according to the settings in the **Print Object Setting** Dialog Box.

7.7.3 Optional Settings

Optional settings can be made related to displays and printing.
Select ***Display*** - ***Option*** from the Main Menu. The **Option** Dialog Box will be displayed. Optional settings can be made by selecting the **Set**, **Graph**, **XY graph**, **List**, or **Print** Tab Page.

Reset Button
The set values will return to their status when the dialog box was opened.

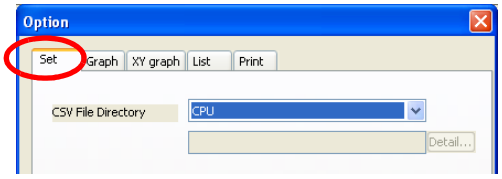
Set as Default Button
The following message will be displayed: "The present option data will be set as the default. Yes or No?" Click the **OK** Button. The present data will be set as the default.

Apply Button
The option data will be overwritten, and the set value will be immediately reflected.

(1) Setting the Set Tab Page

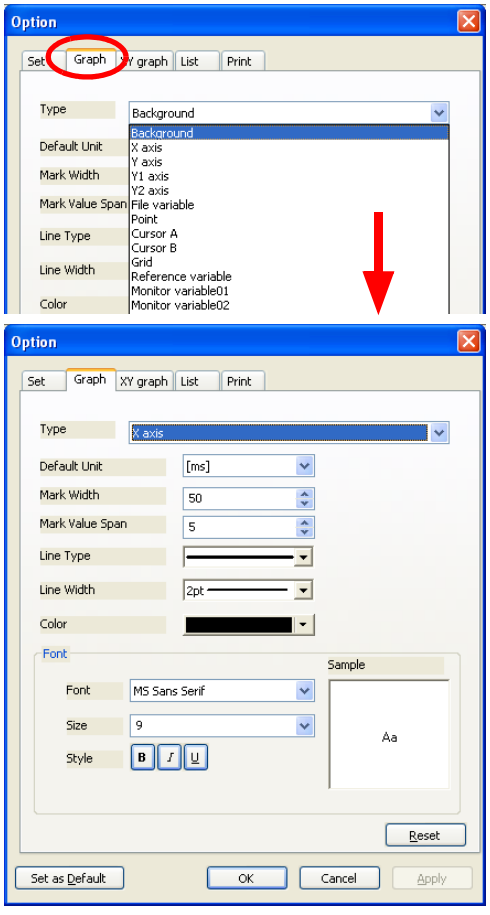
This tab page is used to set the default directory for when trace data is imported or exported.

CPU: The directory installed by MPE720 version 6 is set.
User settings: Click the **Detail** Button and make the settings in the **Folder Reference** Dialog Box.



(2) Setting the Graph Tab Page

The general graph settings can be made on this tab page. Select the elements to be set from the *Type* list, and then set the items.

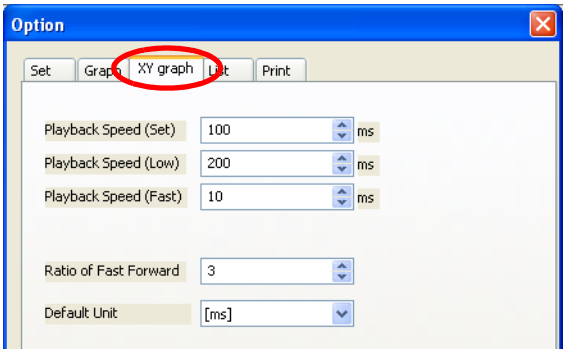


Item		Setting	Type							
			Back-ground color	X axis	Y axis, Y1 axis, Y2 axis	File variable	Points	A and B cursors	Grid	Reference variables Monitor Variables (1 to 16)
Default Unit		Sets the default values for the X axis units (data, ms, sec, mm).		✓						
Mark Width		Sets the size of one X-axis mark in the default units. (When the default unit is ms, one mark will be 50 ms when the mark width is set to 50.)		✓						
Mark Value Span		Sets the span of values (step) displayed for marks.		✓	✓					
Line Type		Sets a solid line, wavy line, broken line, etc.		✓	✓	✓		✓	✓	✓
Line Width		Sets a line width from 1 pt. to 6 pt.		✓	✓	✓	✓	✓	✓	✓
Color		Displays the **Select Color** Dialog Box.	✓	✓	✓	✓	✓	✓	✓	✓
Font	Font	Sets the font for displayed characters.		✓	✓					
	Size	Sets a size from 8 to 72 points. Can be entered directly. A decimal point cannot be entered.		✓	✓					
	Style	**B**: Bold *I*: Italic U: Underline ♦ Multiple selection possible. When OFF: Regular		✓	✓					
	Sample	Displays a sample of font, size, and style settings (display only)		✓	✓					

✓ : Can be set.

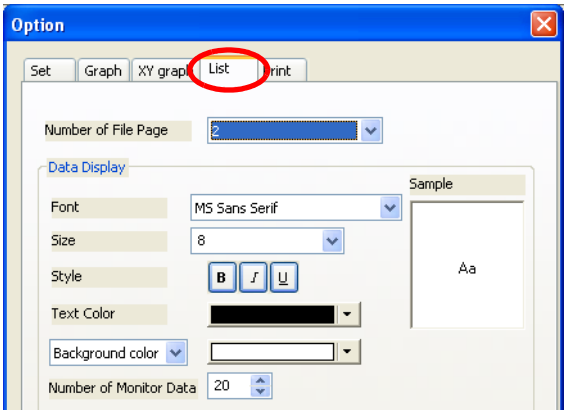
(3) Setting the X-Y Graph Tab Page

Settings related to X-Y graph playback can be made on this tab page.



(4) Setting the List Tab Page

Settings related to the List Area display can be made on this tab page.



Number of File Page: Select the default number of File Pages in the list, from 1 to 8.

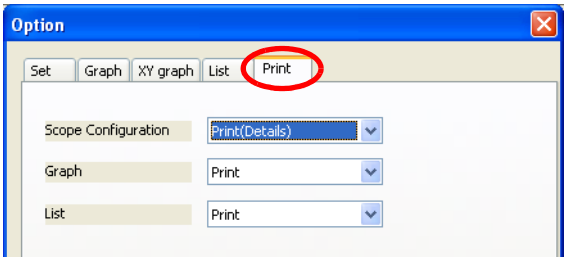
Number of Monitor Data: Set the number of data items to be displayed in the List Area while tracing is being executed.

- All data is displayed when stopped or when a snapshot is taken.

For details on other settings, refer to *(2) Setting the Graph Tab Page*.

(5) Setting the Print Tab Page

Settings related to print object settings (***File - Print Object Setting*** from the Main Menu) can be made on this tab page.



Scope Configuration

Print (Simple): Used for trace data printing when *Scope Configuration* is selected as the print object.
Print (Detail): Used for trace data printing when *Scope Configuration* is selected as the print object.
Do Not Print: *Scope Configuration* cannot be selected as the print object.

Graph

Print: *Graph* can be selected as the print object.
Do Not Print: *Graph* cannot be selected as the print object.

List

Print: *List* can be selected as the print object.
Do Not Print: *List* cannot be selected as the print object.

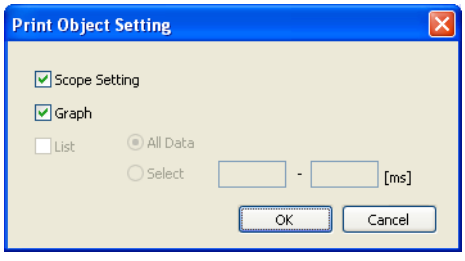


Fig. 7.2 Print Object Setting Dialog Box (When *List* Is Set to *Do Not Print*)

Chapter 8

Electronic Cam Data Preparation Tool

This chapter describes how to start the Electronic Cam Data Preparation Tool.

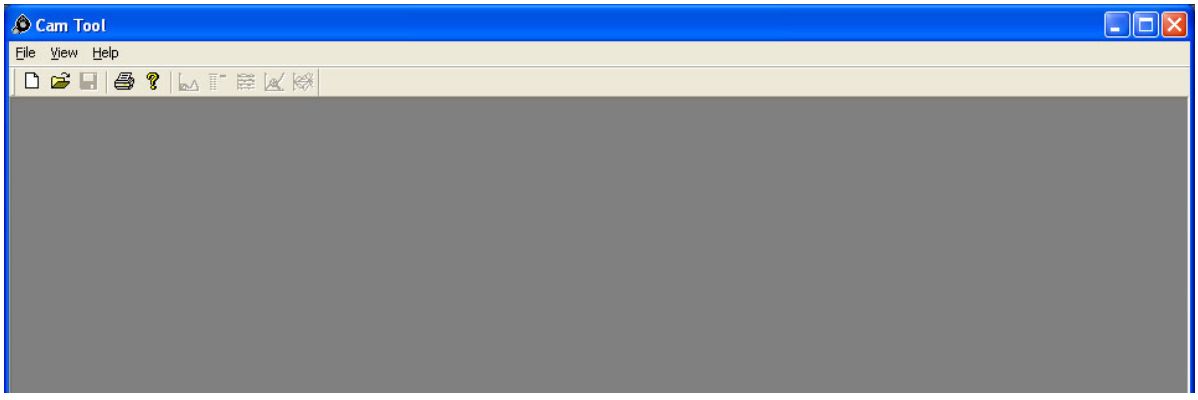
8.1 Overview of Electronic Cam Data - 8-2
8.2 Starting and Operating the Electronic Cam Data Tool - - - - - - - - - - - - - - - - - 8-2

8.1 Overview of Electronic Cam Data

The Electronic Cam Data Tool is a simulation and conversion tool that reads CSV-format files, tracks transition points, and converts the files to cam data files (.cdt). The converted data can then be transferred from the Cam Data Tool to the Controller.

8.2 Starting and Operating the Electronic Cam Data Tool

The Cam Tool Window is opened by selecting ***Utility - Electronic Cam Tool*** in the Launcher.



For details on operating the Electronic Cam Data Tool, refer to the *Machine Controller MP900/MP2000 Series Electronic Cam Data Preparation Tool Operation Manual (SIEP C880700 18)*.

Chapter 9

Data Table Programs

This chapter describes how to start data table programs.

9.1 Overview of Data Table Programs - 9-2
9.2 Starting and Using Data Table Programs - 9-2

9.1 Overview of Data Table Programs

In data table programs, data used in the main ladder program can be prepared in table format.

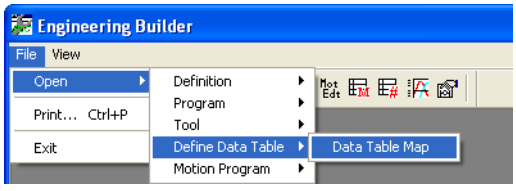
9.2 Starting and Using Data Table Programs

Use the following procedure to start the **Data Table Program** Window.

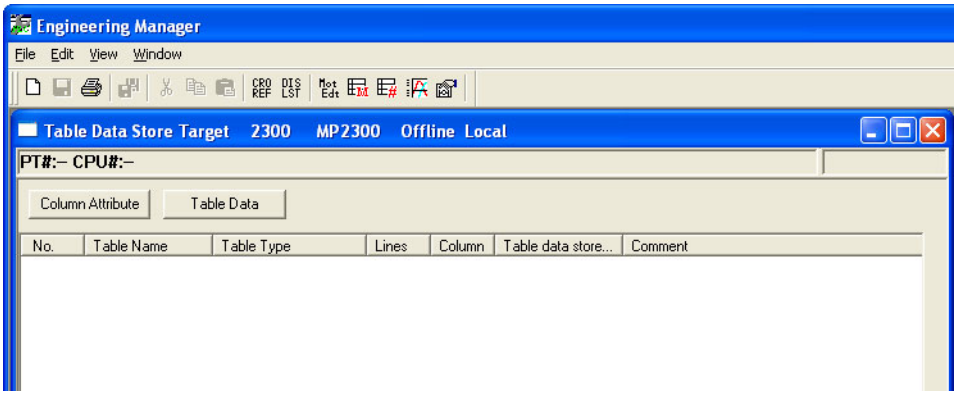
1. Select ***Utility*** - ***Engineering builder*** in the Launcher.

The Engineering Manager will be started.

2. Select ***File*** - ***Open*** - ***Define Data Table*** - ***Data Table Map*** from the Main Menu.



The **Table Data Store Target** Window will be displayed.



For details on preparing data tables, refer to *Chapter 11 Data Table Folders in the Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (SIEP C880700 05).*

Chapter 10

Printing

This chapter describes how to print out ladder programs and other programs.

10.1 Printing Ladder Programs - 10-2
10.1.1 Page Setup - 10-2
10.1.2 Print Previews - 10-3
10.1.3 Printing - 10-5
10.1.4 Printing Cross-Reference Information - 10-8
10.1.5 Printing Call Program Instructions (FUNC/SEE/MSEE) - 10-9
10.2 Printing Other Programs - 10-11

10.1 Printing Ladder Programs

A ladder program can be printed page by page. MPE720 version 6 contains various printing functions, such as print preview display, page setting, cross-reference information printing, closed scope printing, and circuit printing in reduced-size.
Current values displayed while online can not be displayed in print preview or printed.

- Refer to *10.2 Printing Other Programs* for information on printing CP ladder programs.

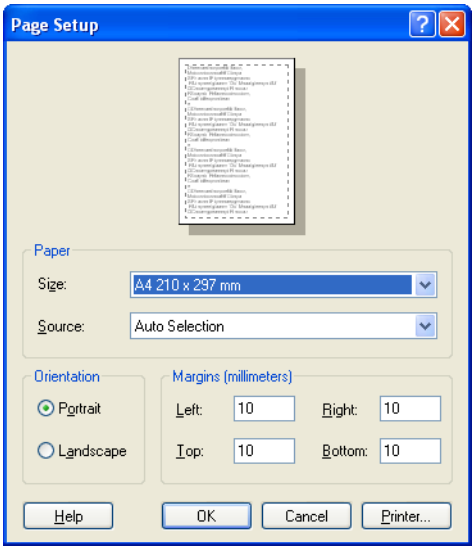
- With project link connection and direct connection to a Machine Controller, the project file will appear on screen. However, the ladder program saved in the Machine Controller RAM will be printed out.
- Refer to *1.9.1 Connecting to Machine Controllers* for details on project link connection and direct connection.

10.1.1 Page Setup

Use the following procedure to display the **Page Setup** Dialog Box and make the page settings.

1. Open the program to be printed in the main window, and display it in the foreground of the window.
2. Select ***File - Page Setup*** from the Main Menu.

   The **Page Setup** Dialog Box will appear.
3. Set each item, and then click **OK**.



10.1.2 Print Previews

(1) Displaying Print Previews

The following procedure can be used to display a print preview.

1. Open the ladder program for which the print preview is to be displayed in the main window, and display the program in the foreground of the window.

2. Select ***File - Print Preview*** from the Main Menu.

   A print preview for will be displayed for the selected ladder program.

(2) Print Preview Window Operations

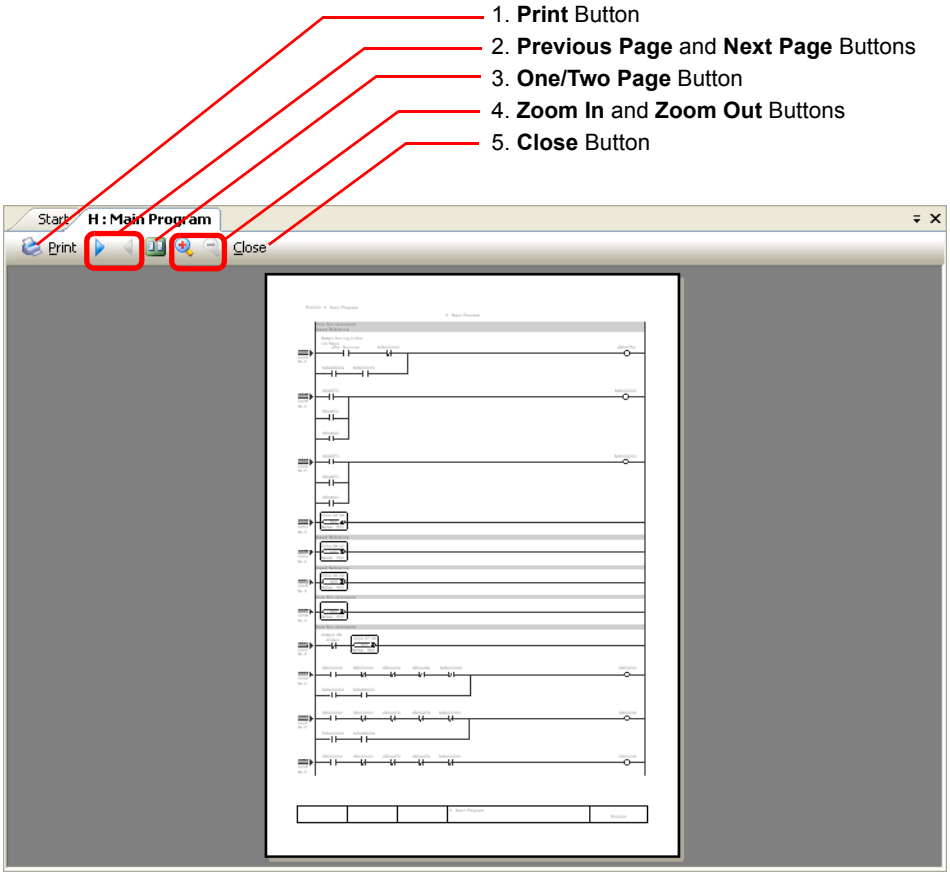


Fig. 10.1 One-page Display

The button operations are described below.

1. **Print** Button

   The **Print** Dialog Box is displayed by clicking the **Print** Button. Pages can then be specified to be printed.

2. **Previous Page** and **Next Page** Buttons

   When there are multiple pages in the print preview, these buttons can be used to change the page displayed.

3. **One/Two Page** Button

The **One/Two Page** Button changes the number of pages displayed in the main window. Displays of pages toggles between one and two pages by clicking this button.

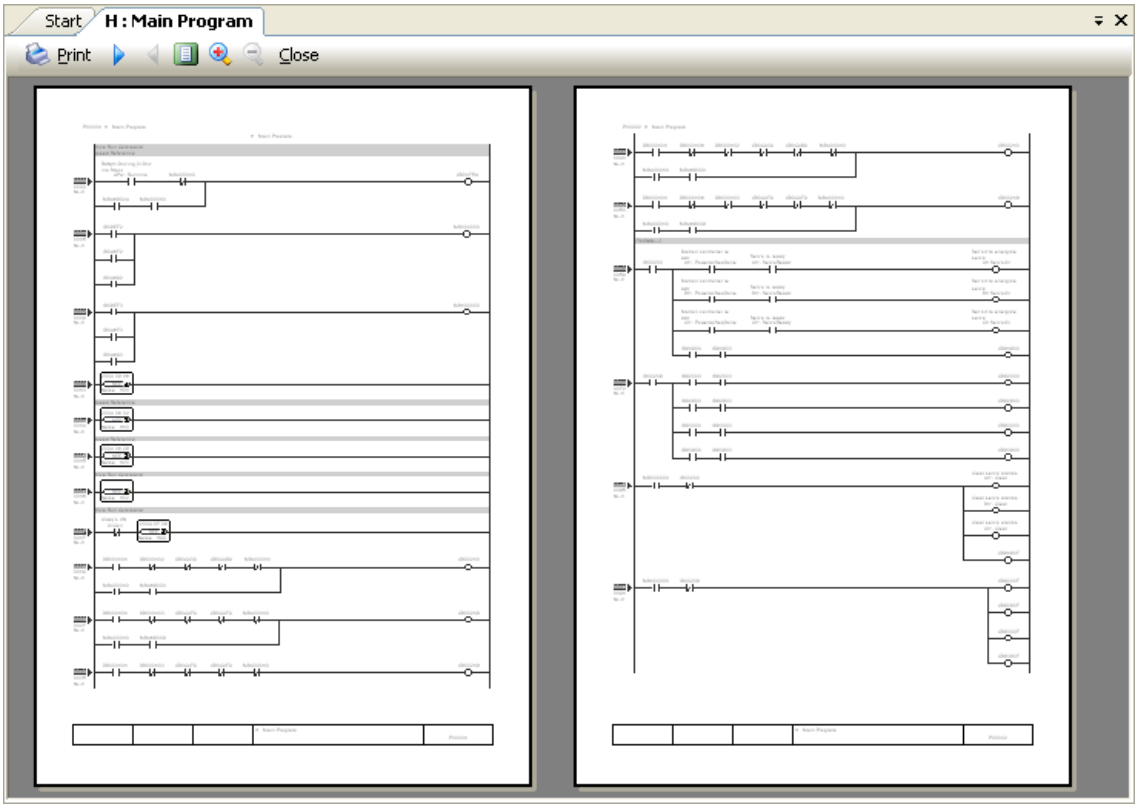


Fig. 10.2 Two-page Display

4. **Zoom In** and **Zoom Out** Buttons

These buttons toggle the display magnification between two levels.

5. **Close** Button

The **Print Preview** Window will be closed by clicking the **Close** Button. The display can be changed by clicking the tabs just as in other main windows until the **Print Preview** Window.

10.1.3 Printing

(1) Printing Each Ladder Program

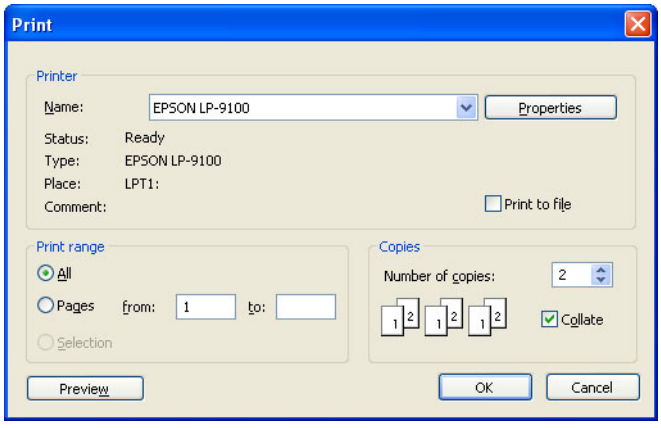
The following two ways can be used to print the ladder program.

[a] Printing from Main Menu

The specified range of the Ladder Program that is displayed in the foreground in the main window can be printed from the main menu.

1. Open the program to be printed in the main window, and display it in the foreground of the window.
2. Select ***File - Print*** from the Main Menu.

   The **Print** Dialog Box will be displayed.
3. Set each item, and then click the **OK** Button. The program will then be printed.



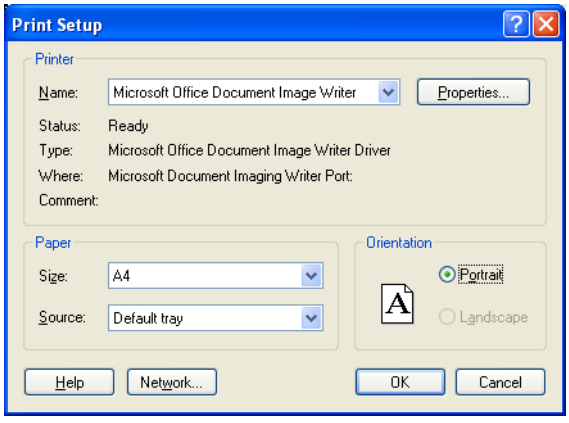
[b] Printing from Ladder Subwindow

Program printing can be directly implemented from the Ladder Subwindow.
When there is no hierarchy of elements under the selected ladder program or no hierarchy of elements is displayed, the **Print Setup** Dialog Box shown below will appear.
When there is a hierarchy of elements under the selected program, refer to *10.1.3 (2) Printing Programs as a Batch*.

1. Right-click the ladder program to be printed and select ***Print*** from the pop-up menu.

The **Print Setup** Dialog Box will appear.

2. Set each item, and then click **OK**. The selected ladder program will be printed.



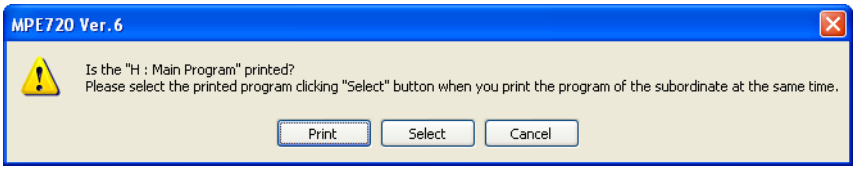
- Refer to *3.4.1 Changing Ladder Subwindow Displays* for display of hierarchy structure.

(2) Printing Programs as a Batch

Programs in a program folder (High-speed, Low-speed, Start, Interrupt, and Function) or a program containing lower hierarchical level programs can be selected for batch printing.

1. Select a program folder ***High-speed***, ***Low-speed***, ***Start***, ***Interrupt***, or ***Function***, or select a program that contains programs of lower hierarchical levels from the Ladder Subwindow. Then, right-click the selected folder or program, and select ***Print*** from the pop-up menu.

When the selected program contains programs of lower hierarchical levels, the following message will appear.


MPE720 Ver.6
Is the "H : Main Program" printed?
Please select the printed program clicking "Select" button when you print the program of the subordinate at the same time.
Print
Select
Cancel

- When a program folder is selected, the above message will not appear. Proceed to step 3.

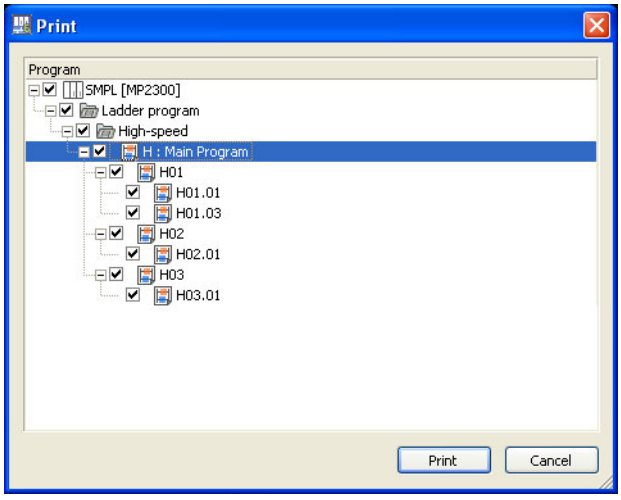
2. Click one of three buttons:

Print: Click this button to print only the selected program. The rest of the operation is the same as described in [b] Executing Print from Ladder Subwindow of *10.1.3 (1) Printing Each Ladder Program*
Select: Click this button to print the selected program together with the lower hierarchical level programs.
Cancel: Click this button to cancel printing.

When the **Select** Button is clicked, the **Print** Dialog Box will appear.

3. All the check boxes of the programs under the selected program folder will be selected. Clear the check boxes of programs not to be printed.

- When some check boxes are deselected in step 3, some check boxes of project files, ladder program folders, and High-speed, Low-speed, Start, Interrupt, and Function Drawing Folders may be shaded. This is because some of the check boxes of the files contained in the folder are selected or not selected.



4. Click **Print**.

The **Print Setup** Dialog Box will appear.

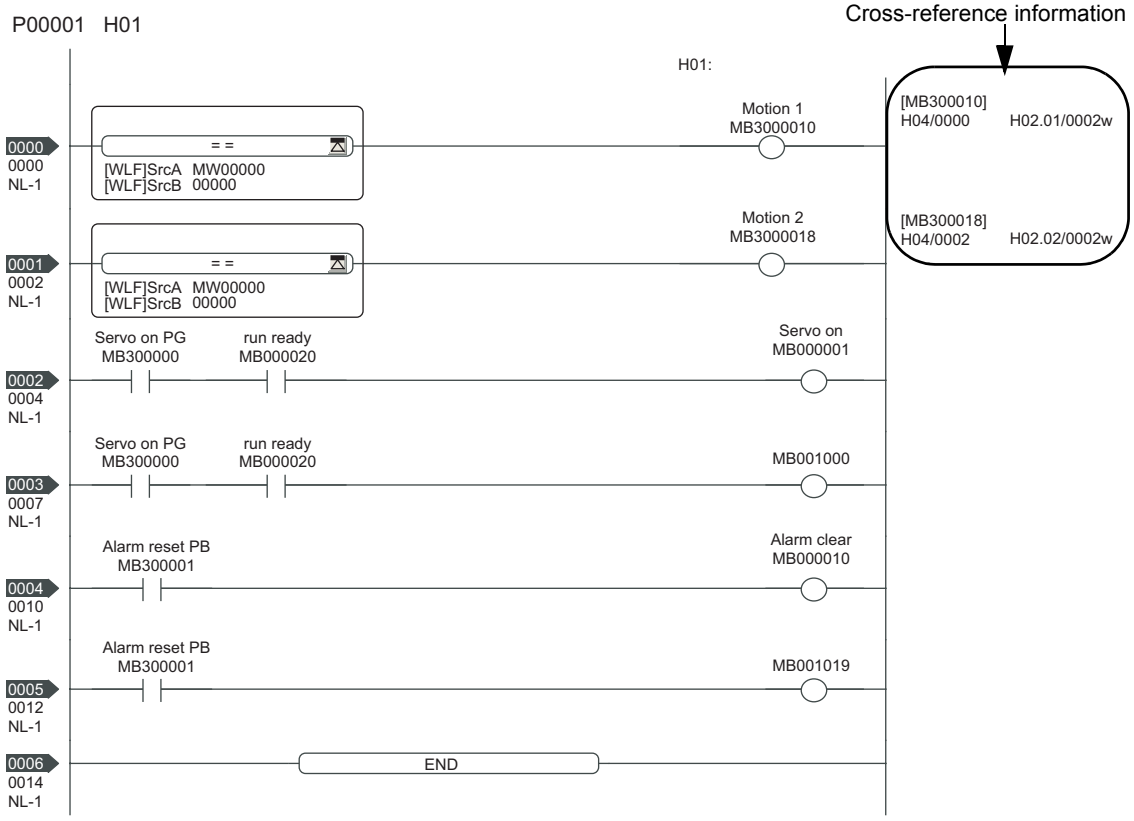
5. Select each item and then click **OK**. All selected programs will be printed out as a batch.

10.1.4 Printing Cross-Reference Information

Cross-reference information is the information on the output registers (variables) used for coils and cross-referenced to another program. The cross-reference information will be printed on the right side of ladder program. The cross-reference information includes the program name and step number (execution step number) to which the output register is cross-referenced. The registers whose cross-reference information can be printed are M, I, O, Y, Z, and A registers. Cross-reference information can be printed only when the project file is open offline.

- Refer to *1.8.16 Print: Ladder* for print setting.
- Refer to *3.5.4 Cross Reference Searching* for cross reference.

The following illustration shows an example of printed program with cross-reference information.



Cross-reference information is given with Program name/Step number + Additional information in the same way as CP ladder programs.

(Ex.) H01.01 ／ 0010w

- 0010w — Additional information
- 0010 — Step number
- H01.01 — Program name

Display Items	Description	Display Example
Program Name	Only program numbers but not comments. In order from High-speed → Low-speed → Start → Interrupt → Function In order from First hierarchical level → Second hierarchical level → Third hierarchical level	H H01.01 FUNC01
Step Number	Step numbers are given with 4 digits in ascending order. For CP ladder programs, step numbers are given with 3 digits.	0001 1000
Additional Information	Subscript “i” or “j”	H01/0010i H01/0010j
	When being used as an output register, “w” is added . For CP ladder programs, “@”	H01/0010w H01/001@

10.1.5 Printing Call Program Instructions (FUNC/SEE/MSEE)

The programs that are called by the FUNC instructions, SEE instructions, and MSEE instructions can be displayed as a tree diagram and printed out.
The hierarchy of levels of call instructions for function programs consists of a maximum of seven levels. For motion programs, there is no limitation of levels.

<Example>

7 levels

H DWG→H01→H01.01→FUNC01→FUNC02→FUNC03→FUNC04→FUNC05→FUNC06→FUNC07

- Call Instruction refers to the instruction to call and reference an instruction object in another program, such as FUNC, MSEE, and SEE.

Use the following procedure to print out the program call instructions.

1. Select **Utility** - **Print Manager** from the Launcher and select the **Program** Tab in the **Print Manager** Window. Click **Details** on the DWG List in the **Program** Tab.

   The **Print Object Setting** Dialog Box will appear.

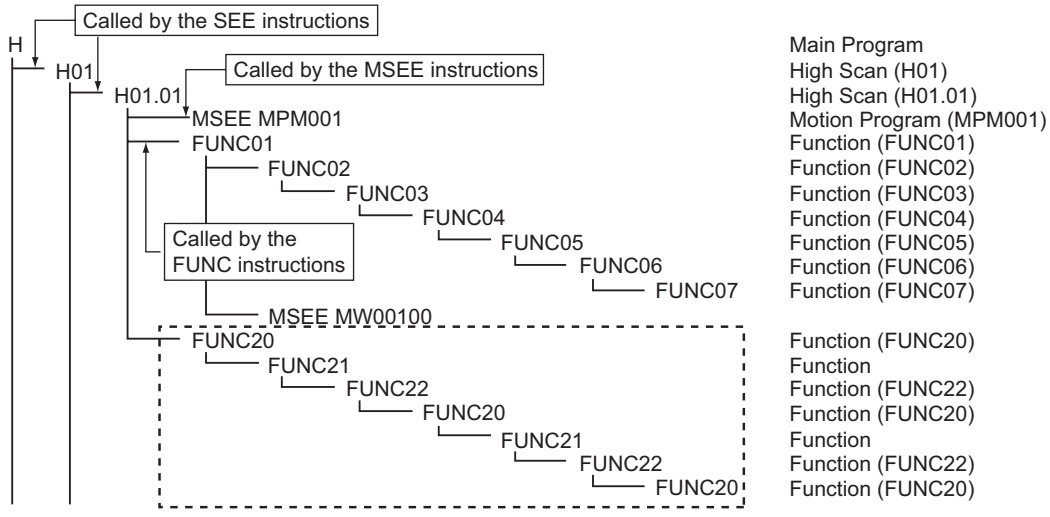
2. Select the **Drawing Tree** check box, and then execute printing.

   The program call instructions will be printed out.

■ Printing FUNC Instructions

The following illustration shows the FUNC instructions that are displayed in a tree diagram when printed.

PDATA1-962401 P00015 Drawing Tree (High Scan Drawings)



■ Printing SEE instructions

By entering the name of a second-level program in The SEE instruction of a first-level program, a program from the second level can now be displayed at the topmost level. In the same way, a third-level program can be displayed at the second level by entering the program name in SEE instruction for a second-level program.

■ Pringing MSEE Instructions

MSEE instructions are displayed together with the variables set in the main program. The display of variables differ depending on whether constants or registers are assigned.

	Constant	Register
Display	MPM is added to a value. Example: ｜ --- MSEE MPM001	Register address, as is Example: ｜ --- MSEE DW00001

10.2 Printing Other Programs

CP ladder programs, registers, definitions (system definition, scan time definition, module configuration, data trace), and motion programs can be printed.
There are two printing methods.

- With project link connection, the data saved in the Machine Controller RAM will be printed for CP ladder programs, and the data saved in a project file will be printed for registers, definitions (system definition, scan time definition, module configuration, data trace), and motion programs.
- With direct connection, data other than CP ladder programs cannot be printed, as no project file was open when connecting the Machine Controller to the MPE720 version 6.

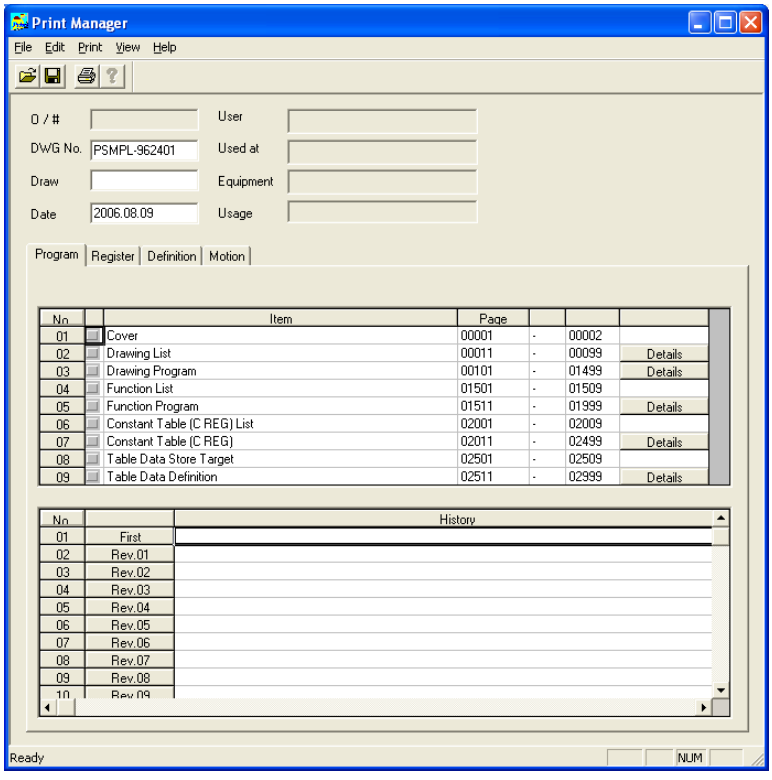
- Refer to *1.9.1 Connecting to Machine Controllers* for details on project link connection and direct connection.

(1) Executing Printing from Launcher

Execute printing from the Launcher.

1. Select ***Utility*** - ***Print Manager*** from the Launcher.

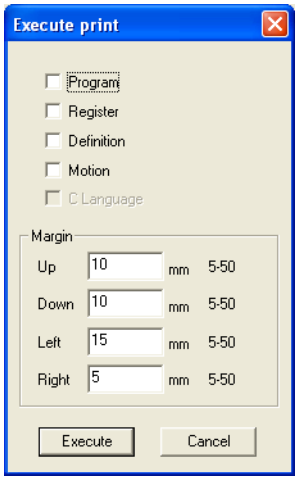
The Print Manager will open.



- Refer to *1.5.1 Names and Descriptions of Window Components* for information on Launcher.

2. Select ***Print*** - ***Execute print*** from the main menu.

The **Execute print** Dialog Box will appear.



3. Select an object to be printed and set the page margins, and then click **Execute**.

The **Print** Dialog Box will appear.

- When printing is executed from the Print Manager for the first time, the **Printers** Dialog Box will appear. Set the printer type and then click **OK**.

4. Set each item, and then click **OK.** Printing will start.

Select ***File*** - ***Print cancel*** from the menu to hold or cancel the printing operation.

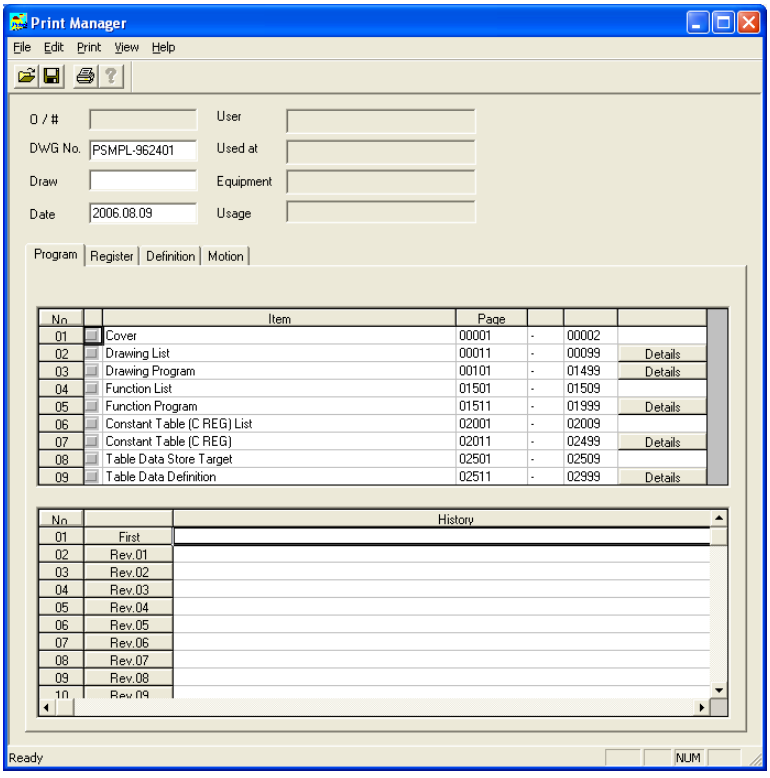
- The List Manager will open at the same time as the Print Manager, and indicate the progress of printing operation.

(2) Executing Printing from Engineering Manager

Execute printing from Engineering Manager.

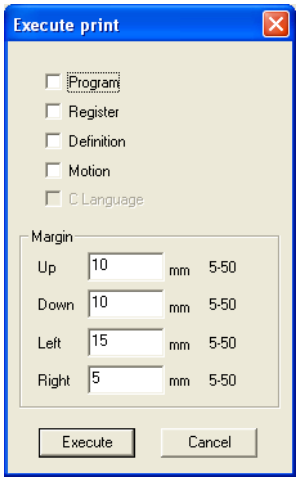
1. Select ***File*** - ***Print*** from the Engineering Manager main menu.

The **Print Manager** Window will open.



2. Select ***Print*** - ***Execute print*** from the main menu.

The **Execute print** Dialog Box will appear.



3. Select an object to be printed and set the page margins, then click **Execute**.

The **Print** Dialog Box will appear.

- When printing is executed from the Print Manager for the first time, the **Printers** Dialog Box will appear. Set the printer type and then click **OK**.

4. Set each item, and then click **OK**. Printing will start.

The List Manager will open at the same time as the Print Manager, and indicate the progress of printing operation.

Chapter 11

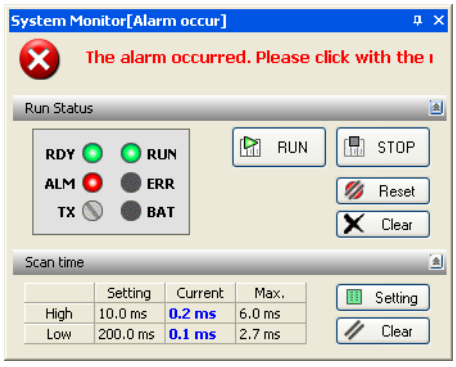
Troubleshooting

This chapter describes how to use the System Monitor function to find errors in the program.

11.1 Troubleshooting and Pop-up Displays - 11-2
11.2 Error Codes - 11-4

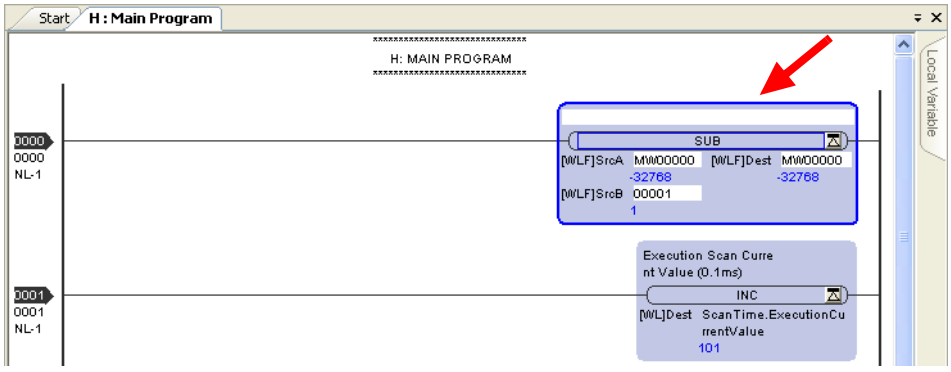
11.1 Troubleshooting and Pop-up Displays

With the default setting, the System Monitor Subwindow is automatically displayed as a pop-up if an alarm occurs.



When an error in the program causes the alarm, that program is opened.

- A setting in the **Environment Settings** Dialog Box specifies whether a pop-up appears when an alarm occurs. For details, refer to *6.2.5 (2) Pop-up Display When an Error Is Detected*.
- The function that identifies locations of errors in the program cannot be used to identify system errors or I/O errors.
- If an error occurs in a function and a program element other than the one containing the faulty function refers to that function, the program that was called up is opened and the function in which the error occurred is displayed. Select *REFER* from the pop-up menu to open the relevant function.



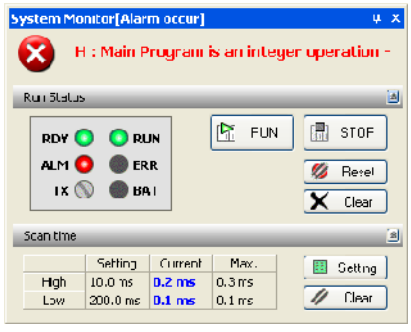
- If an error occurs in a function called from a function, the program in which the error occurred will not be opened.

Follow the procedure shown below when the System Monitor Subwindow appears as a pop-up display.

1. Click the area displayed in red where the following message is displayed: "An alarm has occurred. Troubleshooting is started by clicking here."

The troubleshooting operation will begin. When the location of the error is identified, the relevant program will be opened in the **Main** Window.

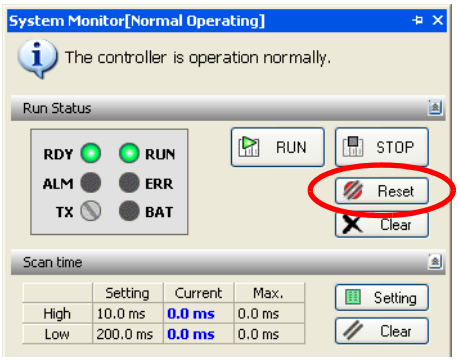
The information on the alarm display will also be changed in the System Monitor Subwindow.



2. Check the displayed alarm information, and correct the error.

3. Click the **Reset** Button.

The display in the System Monitor Subwindow will change back to the normal display.



11.2 Error Codes

The following table lists the error codes that can be detected by the System Monitor.

Error Code	Error Classification
0x01	Integer operation: Underflow
0x02	Integer operation: Overflow
0x03	Integer operation: Division error
0x09	Double integer operation: Underflow
0x0A	Double integer operation: Overflow
0x0B	Double integer operation: Division error
0x10	Integer storage: Non-numeric error
0x11	Integer storage: Underflow
0x12	Integer storage: Overflow
0x21	Real number storage: Underflow
0x22	Real number storage: Overflow
0x23	Real number operation: Division by zero
0x30	Real number operation: Invalid operation
0x31	Real number operation: Exponential underflow
0x32	Real number operation: Exponential overflow
0x33	Real number operation: Division error
0x34	Real number storage: Exponential underflow
0x35	Real number operation: Stack error
0x40	SQRT error
0x41	SIN error
0x42	COS error
0x43	TAN error
0x44	ASIN error
0x45	ACOS error
0x46	ATAN error
0x47	EXP error
0x48	LN error
0x49	LOG error
0x4A	DZA error
0x4B	DZB error
0x4C	LIMIT error
0x4D	PI error
0x4E	PD error
0x4F	PID error
0x50	LAG error
0x51	LLAG error
0x52	FGN error
0x53	IFGN error
0x54	LAU error
0x55	SLAU error
0x56	REM error
0x57	RCHK error
0x58	BSRCH error
0x59	SORT error
0x6D	PI error
0x6E	PD error

Error Code	Error Classification
0x70	LAG error
0x71	LLAG error
0x72	FGN error
0x73	IFGN error
0x74	LAU error
0x75	SLAU error
0x76	FGN error
0x77	IFGN error
0x7E	SLAU error
0x80	BIN error
0x81	BIN error
0x82	BCD error
0x83	BCD error
0x84	PARITY error
0x85	PARITY error
0x86	SQRT error
0x87	SIN error
0x88	COS error
0x89	ATAN error
0x8A	IN error
0x8B	OUT error
0x8C	INR error
0x8D	OUTR error
0x8E	INS error
0x8F	OUTS error
0x90	ROTL error
0x91	ROTR error
0x92	MOVB error
0x93	MOVW error
0x94	SETW error
0x95	XCHG error
0x96	LIMIT error
0x97	LIMIT error
0x98	DZA error
0x99	DZA error
0x9A	DZB error
0x9B	DZB error
0x9C	PWM error
0x9D	SFC error
0x9E	SHFTL error
0x9F	SHFTR error
0xA0	BEXTD error
0xA1	BPRESS error
0xA2	SORT error
0xA3	QSORT error
0xA4	SORT error

(cont'd)

Error Code	Error Classification
0xA5	QSORT error
0xA6	RCHK error
0xA7	RCHK error
0xA8	COPYW error
0xA9	ASCII error
0xAA	BINASC error
0xAB	ASCBIN error
0xAC	BRCH error
0xAD	BSRCH error
0xAE	TMADD error
0xAF	TMSUB error
0xB1	SPEND error
0xC0	TBLBR error
0xC1	TBLBW error
0xC2	TBLSRL error
0xC3	TBLSRC error
0xC4	TBLCL error
0xC5	TBLMV error
0xC6	QTBLR error
0xC7	QTBLRI error
0xC8	QTBLW error
0xC9	QTBLWI error
0xCA	QTBLCL error
0xE0	MSEE error

Appendices

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A Variable Tables

A.1 Variables that are Automatically Assigned by System

The following table provides details on “Variables that are Automatically Assigned by System” provided by MPE720 version 6.

Variable Name			Registor	Comments
OnCoil			SB000004	Always ON
CPU			-	Controller
	Status		-	CPU status
		Ready	SB000400	Ready to run
		Running	SB000401	Running
		Alarm	SB000402	Alarm
		Error	SB000403	Error
		Flash	SB000406	Flash driving
		WriteEnable	SB000407	Possible to write
		StopRequest	SB00040E	Request to stop running
		RunSwitch	SB00040F	RUN switch ON when the power turns ON
		BatteryAlarm	SB000487	Battery alarm
	Error		-	CPU error status
		Failure	SB000410	Serious error
		Exception	SB000413	Exception error
		ProgramError	SB000418	User operation error
		IOError	SB000419	I/O error
	Info		-	CPU information
		SoftwareVersion	SW00020	System program software version number
		MemorySizeAvailable	SL00026	Available program memory (in units of byte)
		MemorySizeTotal	SL00028	All module memory (in unites of byte)
	Switches		-	CPU switch
		Configure	SB000482	Self configuration
		Initialize	SB000483	Clear memory at startup
		Stop	SB000485	User program stop
HighScan			-	High-speed scan relay
	FirstScan		SB000001	After high-speed scan starts, only the first scan ON
	Flicker		-	Flicker
		FlickerScan	SB000010	1-scan flicker relay (high-speed)
		Fricker500ms	SB000011	0.5s flicker relay (high-speed)
		Flicker1s	SB000012	1.0s flicker relay (high-speed)
		Flicker2s	SB000013	2.0s flicker relay (high-speed)
	Sampling		-	Sampling relay
		Sampling500ms	SB000014	0.5s sampling relay (high-speed)
		Sampling1s	SB000015	1.0s sampling relay (high-speed)
		Sampling2s	SB000016	2.0s sampling relay (high-speed)
		Sampling60s	SB000017	60.0s sampling relay (high-speed)
	OnAfter		-	Relay after high-speed scan start
		OnAfter1s	SB000018	ON 1.0s after high-speed scan start
		OnAfter2s	SB000019	ON 2.0s after high-speed scan start
		OnAfter5s	SB00001A	ON 5.0s after high-speed scan start

Variable Name			Registor	Comments
LowScan			-	Low-speed scan relay
	FirstScan		SB000003	After low-speed scan starts, only the first scan ON
	Flicker		-	Flicker relay
		FlickerScan	SB000030	1-scan flicker relay (low-speed)
		Flicker500ms	SB000031	0.5s flicker relay (low-speed)
		Flicker1s	SB000032	1.0s flicker relay (low-speed)
		Flicker2s	SB000033	2.0s flicker relay (low-speed)
	Sampling		-	Sampling relay
		Sampling500ms	SB000034	0.5s sampling relay (low-speed)
		Sampling1s	SB000035	1.0s scampling relay (low-speed)
		Sampling2s	SB000036	2.0s sampling relay (low-speed)
		Sampling60s	SB000037	60.0s sampling relay (low-speed)
	OnAfter		-	Relay after low-speed scan start
		OnAfter1s	SB000038	ON 1.0s after low-speed scan start
		OnAfter2s	SB000039	ON 2.0s after low-speed scan start
		OnAfter5s	SB00003A	ON 5.0s after low-speed scan start
ErrorHigh			-	High-speed program error
	Count		SW00084	Program error count (high-speed program)
	Code		SW00085	Program error code (high-speed program)
	ProgramNumber		SW00154	Error program number (high-speed program)
	ReferProgramNumber		SW00155	Referencing called program number (high-speed program)
	ReferStep		SW00156	Referencing called step number (high-speed program)
ErrorLow			-	Low-speed program error
	Count		SW00088	Error count (low-speed program)
	Code		SW00089	Error code (low-speed program)
	ProgramNumber		SW00186	Error program number (low-speed program)
	ReferProgramNumber		SW00187	Referencing called program number (low-speed program)
	ReferStep		SW00189	Referencing called step number (low-speed program)
ErrorStart			-	Start program error
	Count		SW00080	Error count (start program)
	Code		SW00081	Error code (start program)
	ProgramNumber		SW00122	Error program number (start program)
	ReferProgramNumber		SW00123	Referencing called program number (start program)
	ReferStep		SW00124	Referencing called step number (start program)
ErrorInterrupt			-	Interrupt program error
	Count		SW00082	Error count (interrupt program)
	Code		SW00083	Error coder (interrupt program)
	ProgramNumber		SW00138	Error program number (interrupt program)
	ReferProgramNumber		SW00139	Referencing called program number (interrupt program)
	ReferStep		SW00140	Referencing called step number (interrupt program)

Variable Name			Registor	Comments
ErrorIO			-	I/O error
	Count		SW00200	I/O error count
	InputCount		SW00201	Input error count
	InputAddress		SW00202	Input error address
	OutputCount		SW00203	Output error count
	OutputAddress		SW00204	Output error address
ScanTime			-	Scan time
	High		-	High-speed scan
		HSet	SW00004	High-speed scan set value (0.1 ms)
		HCurrent	SW00005	High-speed scan current value (0.1 ms)
		HMaximum	SW00006	High-speed scan max. value (0.1 ms)
		HOverCount	SW00044	High-speed scan timeover counter
	Low		-	Low-speed scan
		LSet	SW00010	Low-speed scan set value (0.1 ms)
		LCurrent	SW00011	Low-speed scan current value (0.1 ms)
		LMacimum	SW00012	Low-speed scan max. value (0.1 ms)
		LOverCount	SW00046	Low-speed scan timeover counter
	Current		SW00014	Execution scan current value (0.1 ms)
Calendar			-	Calendar
	Year		SW00015	Calendar: Year
	MonthDate		SW00016	Calendar: Month and date
	HoursMinutes		SW00017	Calendar: Hours and minutes
	Second		SW00018	Calendar: Seconds
	Day		SW00019	Calendar: Day of week

A.2 Axis Variable Details

The following table lists the axis variables registered for each logical axis.

- Register address IW (IB/IL/IF/IA) xx00 indicates the leading input register address +00.
- Register address OW (OB/OL/OF/OA) xx00 indicates the leading output register address +00.

(1) SVB-Module Variables for Use with the SERVOPACK

Variable			Register	Comments
ServoOn			OBxx000	Servo ON
CommunicationReset			OBxx00E	Communication reset
MLOCK			OBxx001	Machine lock
AlarmClear			OBxx00F	Alarm clear
ForwardTorqueLimit			OBxx008	Forward external torque limit input
ReverseTorqueLimit			OBxx009	Reverse external torque limit input
Ready			IBxx000	Motion controller operation ready
Running			IBxx001	Running
SystemBusy			IBxx002	System busy
ServoReady			IBxx003	Servo ready
MLKL			IBxx0C6	Machine lock ON (MLKL)
UnitsSelection			OWxx03	Function 1
SignalSelection			OWxx04	Function 2
MotorType			IWxx3F	Motor type
MotionCommand			-	Motion command
	CommandCode		OWxx08	Motion command
	ResponseCode		IWxx08	Motion command response code
	Control		OWxx09	Motion command control flag
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status		IWxx09	Motion command status
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete	IBxx098	Motion command execution completed (COMPLETE)
MotionSubCommand			-	Motion sub command
	CommandCode		OWxx0A	Motion sub command
	ResponseCode		IWxx0A	Motion sub command response code
	Status		IWxx0B	Motion sub command status
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)

Variable			Register	Comments
Position			-	Position
	Command		-	Position reference
		MoveType	OBxx095	Position reference type
		PhaseCompensationType	OBxx096	Phase compensation type with an electronic cam
		Position	OLxx1C	Position reference setting
		StepDistance	OLxx44	STEP distance
		EXPOffset	OLxx46	External positioning move distance
		PhaseCompensation	OLxx28	Phase compensation
		PhasePositionLoopEnable	OBxx051	Disable phase reference generation
	Setting		-	Position setting
		POSCOMPWidth	OLxx1E	Position completed width
		NEARWidth	OLxx20	Position completed width 2
		ZEROWidth	OWxx3D	Home window
		POSCOMPTimeOut	OWxx26	Position complete timeout
		PERRLevel	OBxx010	Deviation abnormal detection error level
		Position.Setting.PERRLimit	OLxx22	Deviation abnormal detection value
	Status		-	Position status
		DEN	IBxx0C0	Distribution completed (DEN)
		POSCOMP	IBxx0C1	Positioning completed (POSCOMP)
		NEAR	IBxx0C3	Position proximity (NEAR)
		ZERO	IBxx0C4	Zero point position (ZERO)
		ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)
	Monitor		-	Position monitor
		TPOS	ILxx0E	Machine coordinate target position (TPOS)
		CPOS	ILxx10	Target position (CPOS)
		MPOS	ILxx12	Machine coordinate system position (MPOS)
		APOS	ILxx16	Machine coordinate feedback position (APOS)
		LPOS	ILxx18	Machine coordinate latch position (LPOS)
		PERR	ILxx1A	Position error (PERR)
		Turns	ILxx1E	POSMAX number of turns
	Latch		-	Latch
		Enable	OBxx004	Latch request
		EnableComplete	IBxx004	Latch request completed
		ZoneEnable	OBxx094	Latch zone enable
		ZoneLowerLimit	OLxx2A	Latch zone lower limit setting
		ZoneUpperLimit	OLxx2C	Latch zone upper limit setting
		LCOMP	IBxx0C2	Latch completed (LCOMP)
	Coordinate		-	Coordinate
		MachineOffset	OLxx48	Zero point offset
		WorkOffset	OLxx4A	Work coordinate system offset
		PresetRequest	OBxx006	POSMAX preset
		PresetTurns	OLxx4C	Preset data of POSMAX turns
		PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)

Variable			Register	Comments
	AbsEncoder		-	ABS encoder
		AbsDataRestore	OBxx007	Infinite length axis position information LOAD request
		AbsDataRestored	IBxx0C8	ABS system infinite length position control information (ABSLDE)
		SetEncoderPositionL	OLxx5E	Absolute position at power OFF (Lower 2 words)
		SetEncoderPositionH	OLxx60	Absolute position at power OFF (Upper 2 words)
		SetPulsePositionL	OLxx62	Modularized position at power OFF (Lower 2 words)
		SetPulsePositionH	OLxx64	Modularized position at power OFF (Upper 2 words)
		GetEncoderPositionL	ILxx5E	Absolute position at power OFF (Lower 2 words)
		GetEncoderPositionH	ILxx60	Absolute position at power OFF (Upper 2 words)
		GetPulsePositionL	ILxx62	Modularized position at power OFF (Lower 2 words)
		GetPulsePositionH	ILxx64	Modularized position at power OFF (Upper 2 words)
Speed			-	Speed
	Speed		OLxx10	Speed reference
	TorqueLimit		OLxx14	Positive side limiting torque setting at speed reference
	SecondlySpeedCompensation		OLxx16	Secondary speed compensation
	Override		OWxx18	Speed override
	Acceleration		OLxx36	Linear acceleration time
	Deceleration		OLxx38	Linear deceleration time
	S_CurveTime		OWxx3A	S-curve acceleration time
	SpeedMonitor		ILxx20	Speed reference output monitor
	FeedbackSpeed		ILxx40	Feedback speed
Torque			-	Torque
	Torque		OLxx0C	Torque reference
	SpeedLimit		OWxx0E	Speed limit during torque reference
	TorqueMonitor		ILxx42	Feedback torque
ZeroPointReturn			-	Home return
	Method		OWxx3C	Home return type
	ApproachSpeed		OLxx3E	Approach speed
	CreepSpeed		OLxx40	Creep speed
	Direction		OBxx093	Home direction
	Offset		OLxx42	Home offset
	InputSelect		OBxx05B	INPUT signal for zero point return

Variable		Register	Comments
Gain		-	Gain
	IntegralClear	OBxx00B	Integration reset
	SpeedLoopType	OBxx013	Speed loop P/PI switch
	SelectSecond	OBxx014	Gain switch
	SelectSecond2	OBxx015	Gain switch 2
	PositionLoop	OWxx2E	Position loop gain
	SpeedLoop	OWxx2F	Speed loop gain
	PositionFeedForward	OWxx30	Speed feed forward compensation
	SpeedCompensation	OWxx31	Speed compensation
	PositionIntegration	OWxx32	Position integration time constant
	SpeedIntegration	OWxx34	Speed integration time constant
Alarm		IWxx04	Alarm
	ServoAlarm	IBxx040	Servo driver error
	P_OT	IBxx041	Positive overtravel
	N_OT	IBxx042	Negative overtravel
	P_SOT	IBxx043	Positive soft limit
	N_SOT	IBxx044	Negative soft limit
	ServoOff	IBxx045	Servo OFF
	POSCOMPTimeOut	IBxx046	Positioning time over
	PositionOutOfRange	IBxx047	Excessive positioning moving amount
	SpeedOutOfRange	IBxx048	Excessive speed
	FollowingError	IBxx049	Excessive following error
	FilterTypeChanged	IBxx04A	Filter type change error
	FilterTimeChanged	IBxx04B	Filter time constant change error
	NotZRNC	IBxx04D	Zero point not set
	ServoParameterError	IBxx04F	Servo driver parameter setting error
	ServoCommunicationTimeout	IBxx050	Servo driver synchronization communication error
	ServoCommunicationError	IBxx051	Servo driver communication error
	ServoCommandTimeout	IBxx052	Servo driver command timeout error
	ABSEncoderOverrange	IBxx053	ABS encoder count exceeded
	ScanTimeSettingError	IBxx056	Scanning set error
	MotorTypeError	IBxx05E	Motor type set error
	ConnectionEncoderDiffers	IBxx05F	Connected encoder type error
Warning		ILxx02	Warning
	ParameterNumber	IWxx01	Over range parameter number
	FollowingError	IBxx020	Excessive following error
	SettingParameter	IBxx021	Setting parameter error
	FixedParamter	IBxx022	Fixed parameter error
	ServoWarning	IBxx023	Servo driver error
	MotionCommand	IBxx024	Motion command setting error
	P_OT	IBxx026	Positive overtravel
	N_OT	IBxx027	Negative overtravel
	ServoNotEnabled	IBxx028	Servo not ON
	Communication	IBxx029	Servo driver dommunication warning

Variable			Register	Comments
Servo			-	Network servo
	MonitorALMNo		OWxx4F	Servo alarm monitor number.
	ALMCode		IWxx2D	Servo alarm code
	Status		IWxx2C	Network servo status
		ALM	IBxx2C0	Alarm occurred (ALM)
		WARNING	IBxx2C1	Warning occurred (WARNING)
		CMDRDY	IBxx2C2	Command ready (CMDRDY)
		SVON	IBxx2C3	Servo ON (SVON)
		PON	IBxx2C4	Main power ON (PON)
		MLOCK	IBxx2C5	Machine lock (MLOCK)
		ZPOINT	IBxx2C6	Zero point (ZPOINT)
		PSET	IBxx2C7	Positioning completed (PSET)
		DEN	IBxx2C8	Distribution completed (DEN)
		T_LIM	IBxx2C9	Torque being limited (T_LIM)
		L_CMP	IBxx2CA	Latch completed (L_CMP)
		NEAR	IBxx2CB	Position proximity (NEAR)
		P_SOT	IBxx2CC	Positive soft limit (P_SOT)
		N_SOT	IBxx2CD	Negative soft limit (N_SOT)
	IO		IWxx2E	Network servo I/O monitor
		FowardSideLimitSwitchInput	IBxx2E0	Forward side limit switch input
		ReverseSideLimitSwitchInput	IBxx2E1	Reverse side limit switch input
		DecelerationDogSwitchInput	IBxx2E2	Deceleration dog switch input
		PA	IBxx2E3	Encoder phase-A input (PA)
		PB	IBxx2E4	Encoder phase-B input (PB)
		PC	IBxx2E5	Encoder phase-C input (PC)
		EXT1	IBxx2E6	First external latch input (EXT1)
		EXT2	IBxx2E7	Second external latch input (EXT2)
		EXT3	IBxx2E8	Third external latch input (EXT3)
		Brake	IBxx2E9	Brake output (BRK)
	Monitor		-	Network servo monitor information
		Monitor2Enable	OBxx020	Monitor 2 enabled
		MonitorCode	OWxx4E	Servo user monitor
		MonitorCodeResponse	IWxx2F	Network servo user monitor information
		Monitor2	ILxx30	Servo user monitor 2
		ServoUserMonitor3	ILxx32	Servo user monitor 3
		Monitor4	ILxx34	Servo user monitor 4

Variable			Register	Comments
ServoParameter			-	Servo parameter
	MotionCommand		-	Motion command parameter
		SetNumber	OWxx50	Servo user constant number
		SetSize	OWxx51	Servo user constant number size
		SetValue	OLxx52	Servo user constant set point
		GetNumber	IWxx36	Servo user constant number
		GetValue	ILxx38	Servo user constant reading data
	MotionSubCommand		-	Motion sub command parameter
		SetNumber	OWxx54	Auxiliary servo user constant number
		SetSize	OWxx55	Auxiliary servo user constant number size
		SetValue	OLxx56	Auxiliary servo user constant set point
		GetNumber	IWxx37	Auxiliary servo user constant number
		GetValue	ILxx3A	Auxiliary servo user constant reading data
		FixParameterNumber	OWxx5C	Fixed parameter number
		FixParameterValue	ILxx56	Fixed parameter monitor

(2) SVB-Module Variables for Use with the Inverter

Variable			Register	Comments
DrivePermission			OBxx00D	Drive permission
CommunicationReset			OBxx00E	Communication reset
AlarmClear			OBxx00F	Alarm clear
Ready			IBxx000	Motion controller operation ready
SystemBusy			IBxx002	System busy
InverterReady			IBxx003	Inverter ready
SpeedReference			OWxx11	Speed reference
TorqueReference			OWxx12	Torque reference
TorqueCompensationOption			OWxx13	Torque compensation (optional)
MultiFunctionAnalogOutputFMOption			OWxx14	Multi-function analog output FM (option)
MultiFunctionAnalogOutputAMOption			OWxx15	Multi-function analog output AM (option)
OutputFrequency			IWxx11	Multi-function terminal output
OutputCurrent			IWxx12	Output current
MotorSpeedOption			IWxx13	Motor speed (optional)
TorqueReferenceU109Option			IWxx14	Torque reference (U1-09) (option)
EncoderCounterOption			IWxx15	Encoder counter (optional)
FrequencyReferenceU101Option			IWxx16	Frequence reference (U1-01) (option)
MultiFunctionAnalogInputA2Option			IWxx17	Multi-function analog input A2 (option)
MainBusVoltageOption			IWxx18	Main bus voltage (option)
AlarmCodeOption			IWxx19	Alarm code (option)
WarningCodeOption			IWxx1A	Warning code (option)
AnalogInput3Option			IWxx1C	Multi-function analog A3 (option)
InputOption			IWxx1D	Muti-function input terminal (option)
AnalogInput1Option			IWxx1E	Multi-function analog input A1 (option)
EncoderCounterCH2Option			IWxx1F	Encoder counter (CH2) (option)
Command			-	Command
	CommandCode		OWxx08	Command
	ResponseCode		IWxx08	Command response code
	ResponseAlarmCode		IWxx30	Response alarm code
	InverterAlarmCode		IWxx32	Inverter alarm code
	Status		IWxx09	Motion command status
		Busy	IBxx090	Command executing (BUSY) flag
		Fail	IBxx093	Command error occurrence (FAIL)
		Complete	IBxx098	Command execution completed (COMPLETE)
SubCommand			-	Sub command
	CommandCode		OWxx0A	Sub command
	ResponseCode		IWxx0A	Sub command response code
	AuxiliaryInverterAlarmCode		IWxx33	Auxiliary inverter alarm code
	Status		IWxx0B	Sub command status
		Busy	IBxx0B0	Sub command executing (BUSY) flag
		Fail	IBxx0B3	Sub command error occurrence (FAIL)
		Complete	IBxx0B8	Sub command execution completed (COMPLETE)
	SubCommandResponseStatus		IWxx31	Sub command response status
		SubCommandAlarm	IBxx310	Sub command alarm
		SubCommandWarning	IBxx311	Sub command warning
		SubCommandReady	IBxx312	Sub command ready

Variable		Register	Comments
Alarm		IWxx04	Alarm
	ServoParameterError	IBxx04F	Servo driver parameter setting error
	ServoCommunicationTimeout	IBxx050	Servo driver synchronization communication error
	ServoCommunicationError	IBxx051	Servo driver communication error
	ServoCommandTimeout	IBxx052	Servo driver command timeout error
Warning		ILxx02	Warning
	ParameterNumber	IWxx01	Over range parameter number
	SettingParameter	IBxx021	Setting parameter error
	FixedParamter	IBxx022	Fixed parameter error
	Command	IBxx024	Command setting error
	Communication	IBxx029	Driver communication warning
	SubCommandSetError	IBxx02A	Sub command set error
OutputDataOptionSelection		OWxx0C	Output data ooption selection
	TorqueCompensation	OBxx0C0	Torque compensation
	MultiFunctionAnalogOutputFM	OBxx0C2	Multi-function analog output FM
	MultiFunctionAnalogOutputAM	OBxx0C1	Multi-function analog output AM
	MultiFunctionTerminalOutput	OBxx0C3	Multi-function terminal output
AuxiliaryOutputDataOptionSelection		OWxx0E	Auxiliary output data option selection
	TorqueCompensation	OBxx0E0	Torque compensation
	MultiFunctionAnalogOutputFM	OBxx0E1	Multi-function analog output FM
	MultiFunctionAnalogOutputAM	OBxx0E2	Multi-function analog output AM
	MultiFunctionTerminalOutput	OBxx0E3	Multi-function terminal output
InputDataOptionSelection		OWxx0D	Input data option selection
	MotorSpeed	OBxx0D0	Motor speed
	TorqueReferenceU109	OBxx0D1	Torque reference (U1-09)
	EncoderCounter	OBxx0D2	Encoder counter
	FrequencyReferenceU101	OBxx0D3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	OBxx0D4	Multi-function analog input A2
	MainBusVoltage	OBxx0D5	Main bus voltage
	AlarmCode	OBxx0D6	Alarm code
	WarningCode	OBxx0D7	Warning code
	MultiFunctionAnalogInputA3	OBxx0D9	Multi-function analog input A3
	MultiFunctionInputTerminal	OBxx0DA	Multi-function input terminal
	MultiFunctionAnalogInputA1	OBxx0DB	Multi-function analog input A1
	EncoderCounterCH2	OBxx0DC	Encoder counter (CH2)
InputDataOptionSelectionMonitor		IWxx0D	Input data option selection monitor
	MotorSpeed	IWxx0D0	Motor speed
	TorqueReferenceU109	IWxx0D1	Torque reference (U1-09)
	EncoderCounter	IWxx0D2	Encoder counter
	FrequencyReferenceU101	IWxx0D3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	IWxx0D4	Multi-function analog input A2
	MainBusVoltage	IWxx0D5	Main bus voltage
	AlarmCode	IWxx0D6	Alarm code
	WarningCode	IWxx0D7	Warning code
	MultiFunctionAnalogInputA3	IWxx0D9	Multi-function analog input A3
	MultiFunctionInputTerminal	IWxx0DA	Multi-function input terminal
	MultiFunctionAnalogInputA1	IWxx0DB	Multi-function analog input A1
	EncoderCounterCH2	IWxx0DC	Encoder counter (CH2)

Variable		Register	Comments
AuxiliaryInputDataOptionSelection		OWxx0F	Auxiliary input data option selection
	MotorSpeed	OBxx0F0	Motor speed
	TorqueReferenceU109	OBxx0F1	Torque reference (U1-09)
	EncoderCounter	OBxx0F2	Encoder counter
	FrequencyReferenceU101	OBxx0F3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	OBxx0F4	Multi-function analog input A2
	MainBusVoltage	OBxx0F5	Main bus voltage
	AlarmCode	OBxx0F6	Alarm code
	WarningCode	OBxx0F7	Warning code
	MultiFunctionAnalogInputA3	OBxx0F9	Multi-function analog input A3
	MultiFunctionInputTerminal	OBxx0FA	Multi-function input terminal
	MultiFunctionAnalogInputA1	OBxx0FB	Multi-function analog input A1
	EncoderCounterCH2	OBxx0FC	Encoder counter (CH2)
AuxiliaryInputDataOptionSelectionMonitor		IWxx0F	Auxiliary input data option selection monitor
	MotorSpeed	IBxx0F0	Motor speed
	TorqueReferenceU109	IBxx0F1	Torque reference (U1-09)
	EncoderCounter	IBxx0F2	Encoder counter
	FrequencyReferenceU101	IBxx0F3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	IBxx0F4	Multi-function analog input A2
	MainBusVoltage	IBxx0F5	Main bus voltage
	AlarmCode	IBxx0F6	Alarm code
	WarningCode	IBxx0F7	Warning code
	MultiFunctionAnalogInputA3	IBxx0F9	Multi-function analog input A3
	MultiFunctionInputTerminal	IBxx0FA	Multi-function input terminal
	MultiFunctionAnalogInputA1	IBxx0FB	Multi-function analog input A1
	EncoderCounterCH2	IBxx0FC	Encoder counter (CH2)
InputCommand		OWxx10	Input command
	ForwardRUN	OBxx100	Forward RUN
	ReverseRUN	OBxx101	Reverse RUN
	MultiFunctionInputCommandS3	OBxx102	Multi-function input command S3
	MultiFunctionInputCommandS4	OBxx103	Multi-function input command S4
	MultiFunctionInputCommandS5	OBxx104	Multi-function input command S5
	MultiFunctionInputCommandS6	OBxx105	Multi-function input command S6
	MultiFunctionInputCommandS7	OBxx106	Multi-function input command S7
	MultiFunctionInputCommandS8	OBxx107	Multi-function input command S8
	ExternalFaultInputEF0	OBxx108	External fault input (EF0)
	FaultReset	OBxx109	Fault reset
	MultiFunctionInputCommandS9	OBxx10A	Multi-function input command S9
	MultiFunctionInputCommandS10	OBxx10B	Multi-function input command S10
	MultiFunctionInputCommandS11	OBxx10C	Multi-function input command S11
	MultiFunctionInputCommandS12	OBxx10D	Multi-function input command S12
	FaultTraceClearCommand	OBxx10E	Fault trace dlear command
	ExternalBaseBlockCommand	OBxx10F	External base block command

Variable		Register	Comments
Status		IWxx10	Status
	Alarm	IBxx100	Alarm
	Warning	IBxx101	Warning
	CommandReady	IBxx102	Command ready
	BaseBlock	IBxx103	Base block
	PowerON	IBxx104	Power ON
	DuringRunning	IBxx105	During running
	ZeroSpeed	IBxx106	Zero speed
	ReverseOperation	IBxx107	Reverse operation
	DuringReset	IBxx108	During reset
	DuringSpeedCoincident	IBxx109	During speed coincidence
	InverterReady	IBxx10A	Inverter ready
	OPEError	IBxx10B	OPE error
	MomentaryPowerCut	IBxx10C	Momentary/power cut
	RemoteOperation	IBxx10D	Remote operation
	MotorSelection	IBxx10E	Motor selection
	SetZeroCompleted	IBxx10F	Set zero completed
MultiFuncctionTerminalOutputOption		OWxx16	Multi-function terminal output (option)
	ConstantOutputM1M2MAMB	OBxx160	Contact output (M1-M2)(MA-MB)
	PHC1OutputConstantP1PC	OBxx161	PHC1 output (Contact P1-PC)
	PHC2OutputConstantP2PC	OBxx162	PHC1 output (P2-PC)
	PHC3OutputConstantP3PC	OBxx163	PHC1 output (P3-C3)
	PHC4OutputConstantP4PC	OBxx164	PHC1 output (P4-C4)
DigitalInputTerminalOption		IWxx1D	Digital input terminal (option)
	Terminal1Status	IBxx1D0	Terminal 1 status
	Terminal2Status	IBxx1D1	Terminal 2 status
	Terminal3Status	IBxx1D2	Terminal 3 status
	Terminal4Status	IBxx1D3	Terminal 4 status
	Terminal5Status	IBxx1D4	Terminal 5 status
	Terminal6Status	IBxx1D5	Terminal 6 status
	Terminal7Status	IBxx1D6	Terminal 7 status
	Terminal8Status	IBxx1D7	Terminal 8 status
	Terminal9Status	IBxx1D8	Terminal 9 status
	Terminal10Status	IBxx1D9	Terminal 10 status
	Terminal11Status	IBxx1DA	Terminal 11 status
	Terminal12Status	IBxx1DB	Terminal 12 status
Inverter		-	Inverter
	InverterAlarmMonitorNumber	OWxx32	Inverter alarm monitor number
	AuxiliaryInverterAlarmMonitorNumber	OWxx33	Auxiliary inverter alarm monitor number
	InverterType	IWxx50	Inverter/type
	InverterSoftwareVersionCommunication Board	OWxx60	Inverter/software version (option)
	InverterSoftwareVersionMain	IWxx68	Inverter/software version (main)

Variable			Register	Comments
InverterParameter			-	Inverter parameter
	Command		-	Inverter command parameter
		InverterUserConstant Number	OWxx3C	Inverter user constant number.
		InverterUserConstant NumberSize	OWxx3D	Inverter user constant number size
		InverterUserConstant SetPoint1	OWxx3E	Inverter user constant set point 1
		InverterUserConstant SetPoint2	OWxx3F	Inverter user constant set point 2
		InverterUserConstant SetPoint3	OWxx40	Inverter user constant set point 3
		InverterUserConstant SetPoint4	OWxx41	Inverter user constant set point 4
		InverterUserConstant Number	IWxx3C	Inverter user constant number
		UserInverterConstant ReadingData1	IWxx3E	Inverter user constant reading data 1
		UserInverterConstant ReadingData2	IWxx3F	Inverter user constant reading data 2
		UserInverterConstant ReadingData3	IWxx40	Inverter user constant reading data 3
		UserInverterConstant ReadingData4	IWxx41	Inverter user constant reading data 4
	SubCommand		-	Inverter sub command parameter
		AuxiliaryInverterUser ConstantNumber	OWxx42	Auxiliary inverter user constant number
		AuxiliaryInverterUser ConstantNumberSize	OWxx43	Auxiliary inverter user constant number size
		AuxiliaryInverterUser ConstantSetPoint1	OWxx44	Auxiliary inverter user constant set point 1
		AuxiliaryInverterUser ConstantSetPoint2	OWxx45	Auxiliary inverter user constant set point 2
		AuxiliaryInverterUser ConstantSetPoint3	OWxx46	Auxiliary inverter user constant set point 3
		AuxiliaryInverterUser ConstantSetPoint4	OWxx47	Auxiliary inverter user constant set point 4
		FixedParameterNumber	OWxx48	Fixed parameter number
		AuxiliaryInverterUser ConstantNumber	IWxx42	Auxiliary inverter user constant number.
		AuxiliaryInverterUser ConstantReadingData1	IWxx44	Auxiliary inverter user constant reading data 1
		AuxiliaryInverterUser ConstantReadingData2	IWxx45	Auxiliary inverter user constant reading data 2
		AuxiliaryInverterUser ConstantReadingData3	IWxx46	Auxiliary inverter user constant reading data 3
		AuxiliaryInverterUser ConstantReadingData4	IWxx47	Auxiliary inverter user constant reading data 4
		FixedParameterMonitor	IWxx48	Fixed parameter monitor

Variable		Register	Comments
TransmissionReference		-	Transmission
	TransmissionReferenceOutputData0	OWxx70	Transmission reference output data 0
	TransmissionReferenceOutputData1	OWxx71	Transmission reference output data 1
	TransmissionReferenceOutputData2	OWxx72	Transmission reference output data 2
	TransmissionReferenceOutputData3	OWxx73	Transmission reference output data 3
	TransmissionReferenceOutputData4	OWxx74	Transmission reference output data 4
	TransmissionReferenceOutputData5	OWxx75	Transmission reference output data 5
	TransmissionReferenceOutputData6	OWxx76	Transmission reference output data 6
	TransmissionReferenceOutputData7	OWxx77	Transmission reference output data 7
	TransmissionReferenceOutputData8	OWxx78	Transmission reference output data 8
	TransmissionReferenceOutputData9	OWxx79	Transmission reference output data 9
	TransmissionReferenceOutputData10	OWxx7A	Transmission reference output data 10
	TransmissionReferenceOutputData11	OWxx7B	Transmission reference output data 11
	TransmissionReferenceOutputData12	OWxx7C	Transmission reference output data 12
	TransmissionReferenceOutputData13	OWxx7D	Transmission reference output data 13
	TransmissionReferenceOutputData14	OWxx7E	Transmission reference output data 14
	TransmissionReferenceOutputData15	OWxx7F	Transmission reference output data 15
	TransmissionReferenceInputData0	IWxx70	Transmission reference input data 0
	TransmissionReferenceInputData1	IWxx71	Transmission reference input data 1
	TransmissionReferenceInputData2	IWxx72	Transmission reference input data 2
	TransmissionReferenceInputData3	IWxx73	Transmission reference input data 3
	TransmissionReferenceInputData4	IWxx74	Transmission reference input data 4
	TransmissionReferenceInputData5	IWxx75	Transmission reference input data 5
	TransmissionReferenceInputData6	IWxx76	Transmission reference input data 6
	TransmissionReferenceInputData7	IWxx77	Transmission reference input data 7
	TransmissionReferenceInputData8	IWxx78	Transmission reference input data 8
	TransmissionReferenceInputData9	IWxx79	Transmission reference input data 9
	TransmissionReferenceInputData10	IWxx7A	Transmission reference input data 10
	TransmissionReferenceInputData11	IWxx7B	Transmission reference input data 11
	TransmissionReferenceInputData12	IWxx7C	Transmission reference input data 12
	TransmissionReferenceInputData13	IWxx7D	Transmission reference input data 13
	TransmissionReferenceInputData14	IWxx7E	Transmission reference input data 14
	TransmissionReferenceInputData15	IWxx7F	Transmission reference input data 15

(3) SVR-Module Variables

Variable			Register	Comments
ServoOn			OBxx000	Servo ON
AlarmClear			OBxx00F	Alarm clear
Ready			IBxx000	Motion controller operation ready
Running			IBxx001	Running
UnitsSelection			OWxx03	Function 1
MotionCommand			-	Motion command
	CommandCode		OWxx08	Motion command
	ResponseCode		IWxx08	Motion command response code
	Control		OWxx09	Motion command control flag
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status		IWxx09	Motion command status
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete	IBxx098	Motion command execution completed (COMPLETE)
MotionSubCommand			-	Motion sub command
	CommandCode		OWxx0A	Motion sub command
	ResponseCode		IWxx0A	Motion sub command response code
	Status		IWxx0B	Motion sub command status
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)
Position			-	Position
	Command		-	Position reference
		MoveType	OBxx095	Position reference type
		Position	OLxx1C	Position reference setting
		StepDistance	OLxx44	STEP distance
	Setting		-	Position setting
		ZEROWidth	OWxx3D	Home window
	Status		-	Position status
		DEN	IBxx0C0	Distribution completed (DEN)
		POSCOMP	IBxx0C1	Positioning completed (POSCOMP)
		NEAR	IBxx0C3	Position proximity (NEAR)
		ZERO	IBxx0C4	Zero point position (ZERO)
		ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)
	Monitor		-	Position monitor
		TPOS	ILxx0E	Machine coordinate target position (TPOS)
		CPOS	ILxx10	Target position (CPOS)
		MPOS	ILxx12	Machine coordinate system position (MPOS)
		APOS	ILxx16	Machine coordinate feedback position (APOS)
		IncPosition	ILxx1C	Target position difference monitor
		Turns	ILxx1E	POSMAX number of turns

Variable			Register	Comments
	Coordinate		-	Coordinate
		MachineOffset	OLxx48	Zero point offset
		WorkOffset	OLxx4A	Work coordinate system offset
		PresetRequest	OBxx006	POSMAX preset
		PresetTurns	OLxx4C	Preset data of POSMAX turns
		PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)
Speed			-	Speed
	Speed		OLxx10	Speed reference
	SecondlySpeedCompensation		OLxx16	Secondary speed compensation
	Acceleration		OLxx36	Linear acceleration time
	Deceleration		OLxx38	Linear deceleration time
	S_CurveTime		OWxx3A	S-curve acceleration time
	BiasSpeedForExponentialAccelerationDecelerationFilter		OWxx3B	Bias speed for exponential acceleration/deceleration filter
	FeedbackSpeed		ILxx40	Feedback speed
Torque			-	Torque
	Torque		OLxx0C	Torque reference
	TorqueMonitor		ILxx42	Torque reference monitor
Gain			-	Gain
	SpeedCompensation		OWxx31	Speed compensation
Alarm			IWxx04	Alarm
	ServoOff		IBxx045	Servo OFF
	ParameterNumber		IWxx01	Over range parameter number
	SettingParameter		IBxx021	Setting parameter error
	FixedParamter		IBxx022	Fixed parameter error
	MotionCommand		IBxx024	Motion command setting error
ServoParameter			-	Servo parameter
	MotionSubCommand		-	Motion sub command parameter
		FixParameterNumber	OWxx5C	Fixed parameter number
		FixParameterValue	ILxx56	Fixed parameter monitor

(4) SVA-Module Variables

Variable			Register	Commendts
ServoOn			OBxx000	Servo ON
MLOCK			OBxx001	Machine lock
AlarmClear			OBxx00F	Alarm clear
Ready			IBxx000	Motion controller operation ready
Running			IBxx001	Running
ServoReady			IBxx003	Servo ready
MLKL			IBxx0C6	Machine lock ON (MLKL)
AbsoluteEncoderCumulativeRevolutions			ILxx4A	Number of accumulated rotations of absolute encoder
InitialNumberOfIncrementalPulses			ILxx4C	Numver of initial incremental pulses
UnitsSelection			OWxx03	Function 1
SignalSelection			OWxx04	Function 2
MotionCommand			-	Motion command
	CommandCode		OWxx08	Motion command
	ResponseCode		IWxx08	Motion command response code
	Control		OWxx09	Motion command control flag
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status		IWxx09	Motion command status
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete	IBxx098	Motion command execution completed (COMPLETE)
MotionSubCommand			-	Motion sub command
	CommandCode		OWxx0A	Motion sub command
	ResponseCode		IWxx0A	Motion sub command response code
	Status		IWxx0B	Motion sub command status
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)

Variable			Register	Commendts
Position			-	Position
	Command		-	Position reference
		MoveType	OBxx095	Position reference type
		PhaseCompensationType	OBxx096	Phase compensation type with an electronic cam
		Position	OLxx1C	Position reference setting
		PositionCompensation	OLxx24	Position compensation
		StepDistance	OLxx44	STEP distance
		EXPOffset	OLxx46	External positioning move distance
		PhaseCompensation	OLxx28	Phase compensation
		PhasePositionLoopEnable	OBxx051	Disable phase reference generation
		AbsoluteReadRequest	OBxx005	Absolute position reading demand
	Setting		-	Position setting
		POSCOMPWidth	OLxx1E	Position completed width
		NEARWidth	OLxx20	Position completed width 2
		ZEROWidth	OWxx3D	Home window
		POSCOMPTimeOut	OWxx26	Position complete timeout
		PERRLevel	OBxx010	Deviation abnormal detection error level
		Position.Setting.PERRLimit	OLxx22	Deviation abnormal detection value
	Status		-	Position status
		DEN	IBxx0C0	Distribution completed (DEN)
		POSCOMP	IBxx0C1	Positioning completed (POSCOMP)
		NEAR	IBxx0C3	Position proximity (NEAR)
		ZERO	IBxx0C4	Zero point position (ZERO)
		ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)
		AbsolutePositionReadCompleted	IBxx0C7	Absolute position read completed
		RotationalDirectionOfAbsoluteEncoder	IBxx0CA	Report of rotating direction when absolute encoder is used
	Monitor		-	Position monitor
		TPOS	ILxx0E	Machine coordinate target position (TPOS)
		CPOS	ILxx10	Target position (CPOS)
		MPOS	ILxx12	Machine coordinate system position (MPOS)
		APOS	ILxx16	Machine coordinate feedback position (APOS)
		LPOS	ILxx18	Machine coordinate latch position (LPOS)
		PERR	ILxx1A	Position error (PERR)
		IncPosition	ILxx1C	Target position difference monitor
		Turns	ILxx1E	POSMAX number of turns
	Latch		-	Latch
		Enable	OBxx004	Latch request
		ZoneEnable	OBxx094	Latch zone enable
		ZoneLowerLimit	OLxx2A	Latch zone lower limit setting
		ZoneUpperLimit	OLxx2C	Latch zone upper limit setting
		LCOMP	IBxx0C2	Latch completed (LCOMP)

Variable			Register	Commendts
	Coordinate		-	Coordinate
		MachineOffset	OLxx48	Zero point offset
		WorkOffset	OLxx4A	Work coordinate system offset
		PresetRequest	OBxx006	POSMAX preset
		PresetTurns	OLxx4C	Preset data of POSMAX turns
		PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)
	AbsEncoder		-	ABS encoder
		AbsDataRestore	OBxx007	Infinite length axis position information LOAD request
		AbsDataRestored	IBxx0C8	ABS system infinite length position control information (ABLDE)
		SetEncoderPositionL	OLxx5E	Absolute position at power OFF (Lower 2 words)
		SetEncoderPositionH	OLxx60	Absolute position at power OFF (Upper 2 words)
		SetPulsePositionL	OLxx62	Modularized position at power OFF (Lower 2 words)
		SetPulsePositionH	OLxx64	Modularized position at power OFF (Upper 2 words)
		GetEncoderPositionL	ILxx5E	Absolute position at power OFF (Lower 2 words)
		GetEncoderPositionH	ILxx60	Absolute position at power OFF (Upper 2 words)
		GetPulsePositionL	ILxx62	Modularized position at power OFF (Lower 2 words)
		GetPulsePositionH	ILxx64	Modularized position at power OFF (Upper 2 words)
Speed			-	Speed
	SpeedAmendsDuringPositionControl		OBxx012	Speed amends is effective at the position command
	Speed		OLxx10	Speed reference
	ForwardSpeedLimit		OWxx12	Positive speed limit
	ReverseSpeedLimit		OWxx13	Negative speed limit
	TorqueLimit		OLxx14	Positive side limiting torque setting at speed reference
	SecondlySpeedCompensation		OLxx16	Secondary speed compensation
	Override		OWxx18	Speed override
	Acceleration		OLxx36	Linear acceleration time
	Deceleration		OLxx38	Linear deceleration time
	S_CurveTime		OWxx3A	S-curve acceleration time
	BiasSpeedForExponentialAccelerationDecelerationFilter		OWxx3B	Bias speed for exponential acceleration/deceleration filter
	SpeedMonitor		ILxx20	Speed reference output monitor
	IntegralOutputMonitor		ILxx24	Integral output monitor
	PrimaryLagMonitor		ILxx26	Primary lag monitor
	PositionLoopOutputMonitor		ILxx28	Position loop output monitor
	FeedbackSpeed		ILxx40	Feedback speed
Torque			-	Torque
	Torque		OLxx0C	Torque reference
	SpeedLimit		OWxx0E	Speed limit during torque reference
	TorqueReferencePrimaryLagFilter		OWxx33	Torque reference 1st-order lag filter
	TorqueMonitor		ILxx42	Feedback torque

Variable			Register	Commendts
ZeroPointReturn			-	Home return
	Method		OWxx3C	Home return method
	ApproachSpeed		OLxx3E	Approach speed
	CreepSpeed		OLxx40	Creep speed
	Direction		OBxx093	Home direction
	Offset		OLxx42	Home offset
	DecelerationLS		OBxx058	Deceleration LS signal selection
	ReverceLimit		OBxx059	Zero point return reverse run side limit signal selection
	ForwardLimit		OBxx05A	Zero point return forward run side limit signal selection
	InputSelect		OBxx05B	INPUT signal for zero point return
Gain			-	Gain
	IntegralClear		OBxx00B	Integration reset
	PositionLoop		OWxx2E	Position loop gain
	PositionFeedForward		OWxx30	Speed feed forward compensation
	SpeedCompensation		OWxx31	Speed compensation
	PositionIntegration		OWxx32	Position integration time constant
	PrimaryLagTimeConstant		OWxx33	Primary delay time constant
Alarm			IWxx04	Alarm
	ServoAlarm		IBxx040	Servo driver error
	P_OT		IBxx041	Positive overtravel
	N_OT		IBxx042	Negative overtravel
	P_SOT		IBxx043	Positive soft limit
	N_SOT		IBxx044	Negative soft limit
	ServoOff		IBxx045	Servo OFF
	POSCOMPTimeOut		IBxx046	Positioning time over
	SpeedOutOfRange		IBxx048	Excessive speed
	FollowingError		IBxx049	Excessively following error
	NotZRNC		IBxx04D	Zero point not set
	ABSEncoderOverrange		IBxx053	ABS encoder count exceeded
	PGDisconnectedError		IBxx054	PG disconnection error
	AccumlatedRotationsReceiveError		IBxx055	Receiving error of accumulated number of rotations
	MotionCommand		IBxx024	Motion command setting error
	P_OT		IBxx026	Positive overtravel
	N_OT		IBxx027	Negative overtravel
	AnalogAdjustNotReadyWarning		IBxx02B	Analog adjust not ready warning
ServoParameter			-	Servo parameter
	MotionSubCommand		-	Motion sub command parameter
		FixParameterNumber	OWxx5C	Fixed parameter number
		FixParameterValue	ILxx56	Fixed parameter monitor
GeneralPurposeAI			-	General-purpose AI
	AI1		IWxx59	General-purpose AI monitor 1
	AI2		IWxx5A	General-purpose AI monitor 2
GeneralPurposeAO			-	General-purpose AO
	AO1		OWxx1A	General-purpose AO1
	AO2		OWxx1B	General-purpose AO2

Variable		Register	Commendts
GeneralPurposeDIMonitor		IWxx58	General-purpose DI monitor
	DI_0	IBxx580	General-purpose DI_0
	DI_1	IBxx581	General-purpose DI_1
	DI_2	IBxx582	General-purpose DI_2
	DI_3	IBxx583	General-purpose DI_3
	DI_4	IBxx584	General-purpose DI_4
	DI_5	IBxx585	General-purpose DI_5
	PGDisconnectedStatus	IBxx587	PG wire breaking down status
GeneralPurposeDO		OWxx5D	General-purpose DO
	DO_0	OBxx5D0	General-purpose DO_0
	DO_1	OBxx5D1	General-purpose DO_1
	DO_2	OBxx5D2	General-purpose DO_2
	DO_3	OBxx5D3	General-purpose DO_3
	DO_4	OBxx5D4	General-purpose DO_4
	DO_5	OBxx5D5	General-purpose DO_5

(5) PO-Module Variables

Variable			Register	Comments
ServoOn			OBxx000	Servo ON
MLOCK			OBxx001	Machine lock
AlarmClear			OBxx00F	Alarm clear
Ready			IBxx000	Motion controller operation ready
Running			IBxx001	Running
MLKL			IBxx0C6	Machine lock ON (MLKL)
UnitsSelection			OWxx03	Function 1
MotionCommand			-	Motion command
	CommandCode		OWxx08	Motion command
	ResponseCode		IWxx08	Motion command response code
	ResponseAlarmCode		IWxx30	Motion command response alarm code
	InverterAlarmCode		IWxx32	Inverter alarm code
	Control		OWxx09	Motion command control flag
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status		IWxx09	Motion command status
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete	IBxx098	Motion comand execution completed (COMPLETE)
Command			-	Command
	CommandCode		OWxx08	Command
	ResponseCode		IWxx08	Command response code
	ResponseAlarmCode		IWxx30	Response alarm code
	InverterAlarmCode		IWxx32	Inverter alarm code
	Control		OWxx09	Command control flag
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status		IWxx09	Command status
		Busy	IBxx090	Command executing (BUSY) flag
		Hold	IBxx091	Command hold completed (HOLD)
		Fail	IBxx093	Command error occurrence (FAIL)
		Complete	IBxx098	Command execution completed (COMPLETE)
MotionSubCommand			-	Motion sub command
	CommandCode		OWxx0A	Motion sub command
	ResponseCode		IWxx0A	Motion sub command response code
	AuxiliaryInverterAlarmCode		IWxx33	Auxiliary inverter alarm code
	Status		IWxx0B	Motion sub command status
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)
	SubCommandResponseStatus		IWxx31	Motion sub command response status
		SubCommandAlarm	IBxx310	Motion sub command alarm
		SubCommandWarning	IBxx311	Motion sub command warning
		SubCommandReady	IBxx312	Motion sub command ready

Variable			Register	Comments
SubCommand			-	Sub command
	CommandCode		OWxx0A	Sub command
	ResponseCode		IWxx0A	Sub command response code
	AuxiliaryInverterAlarmCode		IWxx33	Auxiliary interver alarm code
	Status		IWxx0B	Sub command status
		Busy	IBxx0B0	Sub command executing (BUSY) flag
		Fail	IBxx0B3	Sub command error occurrence (FAIL)
		Complete	IBxx0B8	Sub command execution completed (COMPLETE)
	SubCommandResponseStatus		IWxx31	Sub command response status
		SubCommandAlarm	IBxx310	Sub command alarm
		SubCommandWarning	IBxx311	Sub command warning
		SubCommandReady	IBxx312	Sub command ready
Position			-	Position
	Command		-	Position
		MoveType	OBxx095	Position reference type
		PhaseCompensationType	OBxx096	Phase compensation type with a electronic cam
		Position	OLxx1C	Position reference setting
		PositionCompensation	OLxx24	Position compensation
		StepDistance	OLxx44	STEP distance
		EXPOffset	OLxx46	External positioning move distance
		PhaseCompensation	OLxx28	Phase compensation
		PhasePositionLoopEnable	OBxx051	Disable phase reference generation
		AbsoluteReadRequest	OBxx005	Absolute position reading demand
	Setting		-	Position setting
		POSCOMPWidth	OLxx1E	Position completed width
		NEARWidth	OLxx20	Position completed width 2
		ZEROWidth	OWxx3D	Home window
		POSCOMPTimeOut	OWxx26	Position complete timeout
		PERRLevel	OBxx010	Deviarion abnormal detection error level
		Position.Setting.PERRLimit	OLxx22	Deviation abnormal detection value
	Status		-	Position status
		DEN	IBxx0C0	Distribution completed (DEN)
		POSCOMP	IBxx0C1	Positioning completed (POSCOMP)
		NEAR	IBxx0C3	Position proximity (NEAR)
		ZERO	IBxx0C4	Zero point position (ZERO)
		ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)
	Monitor		-	Position monitor
		TPOS	ILxx0E	Machine coordinate target position (TPOS)
		CPOS	ILxx10	Target position (CPOS)
		MPOS	ILxx12	Machine coordinate system position (MPOS)
		APOS	ILxx16	Machine coordinate feedback position (APOS)
		Turns	ILxx1E	POSMAX number of turns
	Coordinate		-	Coordinate
		MachineOffset	OLxx48	Zero poing offset
		WorkOffset	OLxx4A	Work coordinate system offset
		PresetRequest	OBxx006	POSMAX preset
		PresetTurns	OLxx4C	Preset data of POSMAX turns
		PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)

Variable			Register	Comments
Speed			-	Speed
	Speed		OLxx10	Speed reference
	Override		OWxx18	Speed override
	BiasSpeed		OWxx19	Bias speed
	Acceleration		OLxx36	Linear acceleration time
	Deceleration		OLxx38	Linear deceleration time
	S_CurveTime		OWxx3A	S-curve acceleration time
	BiasSpeedForExponentialAccelerationDecelerationFilter		OWxx3B	Bias speed for exponential acceleration/deceleration filter
	SpeedMonitor		ILxx20	Speed reference output monitor
ZeroPointReturn			-	Home return
	Method		OWxx3C	Home return type
	ApproachSpeed		OLxx3E	Approach speed
	CreepSpeed		OLxx40	Creep speed
	Direction		OBxx093	Home direction
	Offset		OLxx42	Home offset
	DecelerationLS		OBxx058	Deceleration LS signal selection
	ReverceLimit		OBxx059	Zero point return reverse run side limit signal selection
	ForwardLimit		OBxx05A	Zero point return forward run side limit signal selection
Alarm			IWxx04	Alarm
	P_SOT		IBxx043	Positive soft limit
	N_SOT		IBxx044	Negative soft limit
	ServoOff		IBxx045	Servo OFF
	SpeedOutOfRange		IBxx048	Excessive speed
	NotZRNC		IBxx04D	Zero point not set
Warning			ILxx02	Warning
	ParameterNumber		IWxx01	Over range parameter number
	SettingParameter		IBxx021	Setting parameter error
	FixedParamter		IBxx022	Fixed parameter error
	MotionCommand		IBxx024	Motion command setting error
ServoParameter			-	Servo parameter
	MotionSubCommand		-	Motion sub command parameter
		FixParameterNumber	OWxx5C	Fixed parameter number
		FixParameterValue	ILxx56	Fixed parameter monitor
GeneralPurposeDIMonitor			IWxx58	General-purpose DI monitor
	DI_0		IBxx580	General-purpose DI_0
	DI_1		IBxx581	General-purpose DI_1
	DI_2		IBxx582	General-purpose DI_2
	DI_3		IBxx583	General-purpose DI_3
	DI_4		IBxx584	General-purpose DI_4
GeneralPurposeDO			OWxx5D	General-purpose DO
	DO_1		OBxx5D1	General-purpose DO_1
	DO_2		OBxx5D2	General-purpose DO_2
	DO_3		OBxx5D3	General-purpose DO_3

A.3 I/O Variables

The names and models of the I/O Modules that are used for I/O variables are listed below. Refer to the table on the reference page for related variables.

I/O Module Name		I/O Module Model	Reference Page
IO		*1	A-27
LIO-01, LIO-02		JAPMC-IO2300, JAPMC-IO2301	A-28
CNTR		*2	A-28
LIO-04, LIO-05		JAPMC-IO2303, JAPMC-IO2304	A-29
DO-01		JAMPMC-DO2300	A-29
AI-01		JAPMC-AN2300	A-29
AO-01		JAPMC-AN2310-E	A-29
CNTR-01		JAPMC-PL2300-E	A-30
MECHATROLINK Distributed I/O			
	24-VDC 64-point I/O	JEPMC-IO350, JEPMC-IO2310/30	A-32
	24-VDC 128-point I/O	JEPMC-IO2320	A-32
	Reversible Counter 2-channel	120EHC21140, JEPMC-PL2900	A-33
	Pulse Output 2-channel	120MMB20230, JEPMC-PL2910	A-34
	Analog Input	120AVI02030	A-36
	Analog Output	120AVO01030	A-36
	100/200-VAC 8-point Output	120DAO83330	A-36
	100-VAC 8-point Output	120DAI53330	A-36
	24-VDC 16-point Input	120DDI34330	A-37
	24-VDC 16-point Output	120DDO34340	A-37

* 1. Built in the CPU of the Machine Controller (MP2100/MP2500, MP2100M/MP2500M, and MP2300)
* 2. Counter function of LIO-01/LIO-02 Module

- Register address “IW (IB/IL/IF/IA) xx00” indicates the leading input register address + 00.
- Register address “OW (OB/OL//OF/OA) xx00” indicates the leading output register address + 00.

The variables for the I/O Modules listed above are described below.

(1) I/O Module Variables

Variable		Register	Comments
IO_IN		IAxx00	Local I/O, 16 inputs
	DI_00	IBxx000	Input 0
	⋮	⋮	⋮
	DI_15	IBxx00F	Input 15
IO_OUT		OAxx01	Local I/O, 16 outputs
	DO_00	OBxx010	Output 0
	⋮	⋮	⋮
	DO_15	OBxx01F	Output 15

(2) LIO-01 Module Variables

Variable		Register	Comments
LIO_IN		IAxx00	Local I/O, 16 inputs
	DI_00	IBxx000	Input 0
	⋮	⋮	⋮
	DI_15	IBxx00F	Input 15
LIO_OUT		OAxx01	Local I/O, 16 outputs
	DO_00	OBxx010	Output 0
	⋮	⋮	⋮
	DO_15	OBxx01F	Output 15

(3) CNTR Module Variables

Variable			Register	Comments
CNTR_IN			IAxx00	Counter Input
	RUNSTS		IWxx00	Status
		DataError	IBxx000	Data Setting Error
		FixedParameterError	IBxx001	Fixed Parameter Error
		PresetCompleted	IBxx002	Count Value Preset Completed
		PILatchCompleted	IBxx003	PI Latch Completed
		PulseAB0	IBxx004	Pulse-A/B 0
		CoincidenceSignal	IBxx005	Coincidence Detection
		PulseAStatus	IBxx006	Phase-A Status
		PulseBStatus	IBxx007	Phase-B Status
		WritingFixedParameter	IBxx009	Writing Fixed Parameter
		DisconnectedAlarm	IBxx00A	Disconnect Alarm
		POSMAXCompleted	IBxx00C	POSMAX Turns Preset Completed
		ModuleReady	IBxx00F	Module Ready
	PDV		ILxx02	Incremental pulses
	PFB		ILxx04	Counter Value
	FREQ		ILxx06	PI latch Value
	PDVG		ILxx08	Incremental Pulse After Conversion
	PFBG		ILxx0A	Current Count Value After Conversion
	FREQG		ILxx0C	PI Latch Value After Conversion
	POSMAX		ILxx0E	Numver of POSMAX Turns
	FeedBackSpeed		ILxx10	Feedback Speed
CNTR_OUT			OAxx00	Counter Output
	RUNMOD		OWxx00	Command Settings
		Prohibited	OBxx000	Count Disable
		PresetRequest	OBxx001	Count Preset Request
		PILatchRequest	OBxx002	PI Latch Detection Request
		CoincidenceRequest	OBxx003	Coincidence Detection Request
		POSMAXRequest	OBxx004	POSMAX Turns Preset Request
	FunctionSelections		OWxx01	Function Selection
	PPSDAT		OLxx02	Count Preset Value
	COINDAT		OLxx04	Coincidence Detection Value
	POSMAX		OLxx06	POSMAX Turns Preset Value

(4) LIO-04 Module Variables

Variable		Register	Comments
LIO32_IN		IAxx00	Local I/O, 32 inputs
	DI_00	IBxx000	Input 0
	⋮	⋮	⋮
	DI_31	IBxx01F	Input 31
LIO32_OUT		OAxx00	Local I/O, 32 outputs
	DO_00	OBxx000	Output 0
	⋮	⋮	⋮
	DO_31	OBxx01F	Output 31

(5) DO-01 Module Variables

Variable		Register	Comments
DO_OUT		OAxx00	Digital outputs
	DO_00	OBxx000	Output 0
	⋮	⋮	⋮
	DO_63	OBxx03F	Output 63

(6) AI-01 Module Variables

Variables		Register	Comments
AI_IN		IAxx00	Analog inputs
	CH1	IWxx00	Analog input CH1
	⋮	⋮	⋮
	CH8	IWxx07	Analog input CH8

(7) AO-01 Module Variables

Variable		Register	Comments
AVO_OUT		OAxx00	Analog outputs
	CH1	OWxx00	Analog output CH1
	⋮	⋮	⋮
	CH4	OWxx03	Analog output CH4

(8) CNTR-01 Module Variables

Variable			Register	Comments
CNTR1_IN			IAxx00	1 Channel Counter Input
	RUNSTS		IWxx00	Status
		DataError	IBxx000	Data Setting Error
		FixedParameterError	IBxx001	Fixed Parameter Error
		PresetCompleted	IBxx002	Count Value Preset Completed
		PILatchCompleted	IBxx003	PI Latch Completed
		Pulse0	IBxx004	Pulse A/B 0
		CoincidenceSignal	IBxx005	Coincidence Detection
		PulseAStatus	IBxx006	Phase-A Status
		PulseBStatus	IBxx007	Phase-B Status
		PulseCStatus	IBxx008	Phase-C Status
		WritingFixedParameter	IBxx009	Writing Fixed Parameter
		DisconnectedAlarm	IBxx00A	Disconnect Alarm
		POSMAXCompleted	IBxx00C	POSMAX Turns Preset Completed
		MultipurposeSignal	IBxx00D	Multipurpose Signal
		ModuleReady	IBxx00F	Module Ready
	IncrementalPulses		ILxx02	Incremental Pulses
	CounterValue		ILxx04	Counter Value
	PILatchValue		ILxx06	PI Latch Data
	IncrementPulseAfterConversion		ILxx08	Incremental Pulse after Conversion
	CountValueAfterCounversion		ILxx0A	Current Count Value After Conversion
	PILatchValueAfterCounversion		ILxx0C	PI Latch Data After Conversion
	POSMAXTurnsNumber		ILxx0E	Number of POSMAX Turns
	FeedBackSpeed		ILxx10	Feedback Speed
	DetectedFrequency		ILxx12	Detected Frequency
	AverageFrequency		ILxx14	Average Frequency
	SystemMonitor		ILxx1E	System Monitor
CNTR1_OUT			OAxx00	1 Channel Counter Output
	RUNMODE		OWxx00	Operation Mode
		Prohibited	OBxx000	Count Disable
		PresetRequest	OBxx001	Count Preset Request
		PILatchRequest	OBxx002	PI Latch Detection Request
		CoincidenceRequest	OBxx003	Coincidence Detection Request
		POSMAXRequest	OBxx004	POSMAX Turns Preset Request
		MultipurposeOutPut	OBxx005	Multipurpose Output
	FunctionSelections		OWxx01	Function Selection
	CountPresettingData		OLxx02	Count Preset Value
	AgreedDetectionValue		OLxx04	Coincidence Detection Value
	PresetDataPOSMAXTurns		OLxx06	POSMAX Turns Preset Value
	ZoneOutputMinimumValue		OLxx08	Minimum Value of Range of Zone Output
	ZoneOutputMaximumValue		OLxx0A	Maximum Value of Range of Zone Output
	SpeedCoincidenceDetectionSetting		OLxx0C	Speed Coincidence Detection Setting
	SpeedCoincidenceDetectionWidth		OLxx0E	Speed Coincidence Detection Width
	FrequencyCoincidenceDetectionSetting		OLxx10	Frequency Coincidence Detection Setting
	FrequencyCoincidenceDetectionWidth		OLxx12	Frequency Coincidence Detection Width
	AveragingCountSetting		OLxx14	Averaging Count Setting
	SystemMonitor		OLxx1E	System Monitor

Variable			Register	Comments
CNTR2_IN			IAxx20	2 Channel Counter Input
	RUNSTS		IWxx20	Status
		DataError	IBxx200	Data Setting Error
		FixedParameterError	IBxx201	Fixed Parameter Setting Error
		PresetCompleted	IBxx202	Count Value Preset Completed
		PILatchCompleted	IBxx203	PI Latch Completed
		Pulse0	IBxx204	Pulse-A/B 0
		CoincidenceSignal	IBxx205	Coincidence Detection
		PulseAStatus	IBxx206	Phase-A Status
		PulseBStatus	IBxx207	Phase-B Status
		PulseCStatus	IBxx208	Phase- C Status
		WritingFixedParameter	IBxx209	Writing Fixed Parameter
		DisconnectedAlarm	IBxx20A	Disconnect Alarm
		POSMAXCompleted	IBxx20C	POSMAX Turns Preset Completed
		MultipurposeSignal	IBxx20D	Multipurpose Signal
		ModuleReady	IBxx20F	Module Ready
	IncrementalPulses		ILxx22	Incremental Pulses
	CounterValue		ILxx24	Counter Value
	PILatchValue		ILxx26	PI Latch Value
	IncrementPulseAfterConversion		ILxx28	Incremental Pulse After Conversion
	CountValueAfterCounversion		ILxx2A	Current Counter Value After Conversion
	PILatchValueAfterCounversion		ILxx2C	PI Latch Value After Conversion
	POSMAXTurnsNumber		ILxx2E	Number of POSMAX Turns
	FeedBackSpeed		ILxx30	Feedback Speed
	DetectedFrequency		ILxx32	Detected Frequency
	AverageFrequency		ILxx34	Average Frequency
	SystemMonitor		ILxx3E	System Monitor
CNTR2_OUT			OAxx20	2 Channel Counter Output
	RUNMODE		OWxx20	Operation Mode
		Prohibited	OBxx200	Count Disable
		PresetRequest	OBxx201	Count Preset Request
		PILatchRequest	OBxx202	PI Latch Detection Request
		CoincidenceRequest	OBxx203	Coincidence Detection Request
		POSMAXRequest	OBxx204	POSMAX Turns Preset Request
		MultipurposeOutPut	OBxx205	Multipurpose Output
	FunctionSelections		OWxx21	Function Selection
	CountPresettingData		OLxx22	Count Preset Value
	AgreedDetectionValue		OLxx24	Coincidence Detection Value
	PresetDataPOSMAXTurns		OLxx26	POSMAX Turns Preset Value
	ZoneOutputMinimumValue		OLxx28	Minimum Value of Range of Zone Output
	ZoneOutputMaximumValue		OLxx2A	Maximum Value of Range of Zone Output
	SpeedCoincidenceDetectionSetting		OLxx2C	Speed Coincidence Detection Setting
	SpeedCoincidenceDetectionWidth		OLxx2E	Speed Coincidence Detection Width
	FrequencyCoincidenceDetectionSetting		OLxx30	Frequency Coincidence Detection Setting
	FrequencyCoincidenceDetectionWidth		OLxx32	Frequency Coincidence Detection Width
	AveragingCountSetting		OLxx34	Averaging Count Setting
	SystemMonitor		OLxx3E	System Monitor

(9) MECHATROLINK Distributed I/O Module Variables

■ 24-VDC 64-point I/O Module

Variable		Register	Comments
IN1		ILxx00	Input Signal Connector 1
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN32	IBxx01F	Input 32
IN2		ILxx02	Input Signal Connector 2
	IN33	IBxx020	Input 33
	⋮	⋮	⋮
	IN64	IBxx03F	Input 64
OUT1		OLxx00	Output Signal Connector 1
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT32	OBxx01F	Output 32
OUT2		OLXX02	Output Signal Connector 2
	OUT33	OBxx020	Output 33
	⋮	⋮	⋮
	OUT64	OBxx03F	Output 64

■ 24-VDC 128-point I/O Module

Variable		Register	Comments
IN1		IWxx00	Input Signal Connector 1
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN64	IBxx03F	Input 64
IN2		IWxx04	Input Signal Connector 2
	IN65	IBxx040	Input 65
	⋮	⋮	⋮
	IN128	IBxx07F	Input 128
OUT1		OWxx00	Output Signal Connector 1
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT64	OBxx03F	Output 64
OUT2		OBxx04	Output Signal Connector 2
	OUT65	OBxx040	Output 65
	⋮	⋮	⋮
	OUT128	OBxx07F	Output 128

■ Reversible Counter 2-channel Module

Variable			Register	Comments
IN			IAxx00	Input
	Reserve1		IWxx00	Reserved for the System
	Reserve2		IWxx01	Reserved for the System
	InputRelay		IWxx02	Input Relays
		RDY	IBxx020	Ready
		ACK	IBxx021	Setting Normal
		ERR	IBxx022	Error
		CARY1	IBxx028	Counter 1 Carry
		BORW1	IBxx029	Counter 1 Borrow
		N1	IBxx02A	Counter 1 Notch Output Status
		L1	IBxx02B	Counter 1 Latch Input Status
		CARY2	IBxx02C	Counter 2 Carry
		BORW2	IBxx02D	Counter 2 Borros
		N2	IBxx02E	Counter 2 Notch Output Status
		L2	IBxx02F	Counter 2 Latch Input Status
	InputRegsiterW1		IWxx03	Inpur Register Word1
	InputRegsiterW2		IWxx04	Input Register Word2
	InputRegsiterW3		IWxx05	Input Register Word3
	InputRegsiterW4		IWxx06	Input Register Word4
	InputRegsiterL1		ILxx03	Input Register Long1
	InputRegsiterL2		ILxx05	Input Register Long2
OUT			OAxx00	Output
	ScanCounter		OWxx00	Scan Counter
	Reserve1		OWxx01	Reserved for the System
	OutputCoil1		OWxx02	Output Coil 1
		M_SET1	OBxx020	Counter 1 Mode Set
		N_SET1	OBxx021	Counter 1 Notch Point Set
		P_SET1	OBxx022	Counter 1 Current Value Set
		C_ENB1	OBxx023	Counter 1 Count Enable
		N_ENB1	OBxx024	Counter 1 Notch Output Enable
		P_RES1	OBxx025	Counter 1 Current Value Reset
		N_RES1	OBxx026	Counter 1 Notch Output Reset
		L_RES1	OBxx027	Counter 1 Count Value Hold Reset
		M_SET2	OBxx028	Counter 2 Mode Set
		N_SET2	OBxx029	Counter 2 Notch Point Set
		P_SET2	OBxx02A	Counter 2 Current Value Set
		C_ENB2	OBxx02B	Counter 2 Count Enable
		N_ENB2	OBxx02C	Counter 2 Notch Output Enable
		P_RES2	OBxx02D	Counter 2 Current Value Reset
		N_RES2	OBxx02E	Counter 2 Notch Output Reset
		L_RES2	OBxx02F	Counter 2 Count Value Hold Reset

Variable			Register	Comments
	OutputCoil2		OWxx03	Output Coil 2
		N_ON1	OBxx030	Counter 1 Forced Notch Output
		N_ON2	OBxx031	Counter 2 Forced Notch Output
		MON1	OBxx038	Monitor 1
		MON2	OBxx039	Monitor 2
		MON3	OBxx03A	Monitor 3
	OutputRegsiterW1		OWxx04	Output Register Word1
	OutputRegsiterW2		OWxx05	Output Register Word2
	OutputRegsiterW3		OWxx06	Output Register Word3
	OutputRegsiterW4		OWxx07	Output Register Word4
	OutputRegsiterL1		OLxx04	Output Register Long1
	OutputRegsiterL2		OLxx06	Output Register Long2

■ Pulse Output 2-channel Module

Variable			Register	Comments
IN			IAxx00	Input
	Reserve3		IWxx00	Reserved for the System
	Reserve4		IWxx01	Reserved for the System
	InputRelay1		IWxx02	Channel 1 Input Relays
		RDY1	IBxx020	Channel 1 Ready
		MONSEL1	IBxx022	Channel 1 Monitor Parameters
		PACK1	IBxx024	Channel 1 Parameter Setting Normal
		PNACK1	IBxx025	Channel 1 Parameter Setting Error
		MOV1L	IBxx028	Channel 1 Positioning
		JOG1L	IBxx029	Channel 1 JOG Operation
		ZRN1L	IBxx02A	Channel 1 Zero Point Return
		OVER1	IBxx02C	Channel 1 Overheat Input Status
		TIMING1	IBxx02D	Channel 1 Magnetic Excitation Timing Input
		ZRN1	IBxx02E	Channel 1 Zero Point Signal Input Status
		IN1	IBxx02F	Channel 1 General-purpose Input Status
	InputRelay2		IWxx03	Channel 2 Input Relays
		RDY2	IWxx030	Channel 2 Ready
		MONSEL2	IWxx032	Channel 2 Monitor Parameters
		PACK2	IWxx034	Channel 2 Parameter Setting Normal
		PNACK2	IWxx035	Channel 2 Parameter Setting Error
		MOV2L	IWxx038	Channel 2 Positioning
		JOG2L	IWxx039	Channel 2 JOG Operation
		ZRN2L	IWxx03A	Channel 2 Zero Point Return
		OVER2	IWxx03C	Channel 2 Overheat Input Status
		TIMING2	IWxx03D	Channel 2 Magnetic Excitation Timing Input
		ZRN2	IWxx03E	Channel 2 Zero Point Signal Input Status
		IN2	IWxx03F	Channel 2 General-purpose Input Status
	InputRegsiterW1		IWxx04	Input Register Word1
	InputRegsiterW2		IWxx05	Input Register Word2
	InputRegsiterW3		IWxx06	Input Register Word3
	InputRegsiterW4		IWxx07	Input Register Word4
	InputRegsiterL1		ILxx04	Input Register Long1
	InputRegsiterL2		ILxx06	Input Register Long2

Variable			Register	Comments
OUT			OAxx00	Output
	Reserve1		OWxx00	Reserved for the System
	Reserve2		OWxx01	Reserved for the System
	OutputCoil1		OWxx02	Channel 1 Output Coils
		ARST1	OBxx020	Channel 1 Alarm Reset
		CAN1	OBxx021	Channel 1 Cancel
		MONSEL1	OBxx022	Channel 1 Monitor Selector
		PSET1	OBxx023	Channel 1 Parameter Set/Monitor Selector
		PRM10	OBxx024	Channel 1 Parameter Number 0
		PRM11	OBxx025	Channel 1 Parameter Number 1
		PRM12	OBxx026	Channel 1 Parameter Number 2
		PRM13	OBxx027	Channel 1 Parameter Number 3
		MOV1	OBxx028	Channel 1 Positioning
		JOG1	OBxx029	Channel 1 JOG Operation
		ZRN1	OBxx02A	Channel 1 Zero Point Return
		REV1	OBxx02B	Channel 1 JOG/Zero Point Return Direction
		COFF1	OBxx02D	Channel 1 Output Current OFF
		BFREE1	OBxx02E	Channel 1 Electromagnetic Brake Release
		OUT1	OBxx02F	Channel 1 General-purpose Output
	OutputCoil2		OWxx03	Channel 2 Output Coils
		ARST2	OBxx030	Channel 2 Alarm Reset
		CAN2	OBxx031	Channel 2 Cancel
		MONSEL2	OBxx032	Channel 2 Monitor Selector
		PSET2	OBxx033	Channel 2 Parameter Set/Monitor Selector
		PRM20	OBxx034	Channel 2 Parameter Number 0
		PRM21	OBxx035	Channel 2 Parameter Number 1
		PRM22	OBxx036	Channel 2 Parameter Number 2
		PRM23	OBxx037	Channel 2 Parameter Number 3
		MOV2	OBxx038	Channel 2 Positioning
		JOG2	OBxx039	Channel 2 JOG Operation
		ZRN2	OBxx03A	Channel 2 Zero Point Return
		REV2	OBxx03B	Channel 2 JOG/Zero Point Return Direction
		COFF2	OBxx03D	Channel 2 Output Current OFF
		BFREE2	OBxx03E	Channel 2 Electromagnetic Brake Release
		OUT2	OBxx03F	Channel 2 General-purpose Output
	OutputRegsiterW1		OWxx04	Output Register Word1
	OutputRegsiterW2		OWxx05	Output Register Word2
	OutputRegsiterW3		OWxx06	Output Register Word3
	OutputRegsiterW4		OWxx07	Output Register Word4
	OutputRegsiterL1		ILxx04	Output Register Long1
	OutputRegsiterL2		ILxx06	Output Register Long2

■ Analog Input Module

Variable			Register	Comments
IN			IAxx00	Input
	Reserve1		IWxx00	Reserved for the System
	Reserve2		IWxx01	Reserved for the System
	CH1		IWxx02	CH1 Analog Input Value
	CH2		IWxx03	CH2 Analog Input Value
	CH3		IWxx04	CH3 Analog Input Value
	CH4		IWxx05	CH4 Analog Input Value
	Status		IWxx06	Input Signal Status
		CH1	IBxx061	CH1 Input Signal Status
		CH2	IBxx062	CH2 Input Signal Status
		CH3	IBxx063	CH3 Input Signal Status
		CH4	IBxx064	CH4 Input Signal Status
OUT			OAxx00	Output
	Reserve1		OWxx00	Reserved for the System
	Reserve2		OWxx01	Reserved for the System

■ Analog Output Module

Variable		Register	Comments
IN		IAxx00	Input
	Reserve1	IWxx00	Reserved for the System
	Reserve2	IWxx01	Reserved for the System
OUT		OAxx00	Output
	Reserve1	OWxx00	Reserved for the System
	Reserve2	OWxx01	Reserved for the System
	CH1	OWxx02	CH1 Analog Output Value
	CH2	OWxx03	CH2 Analog Output Value

■ 100/200-VAC 8-point Output Module

Variable		Register	Comment
OUT		OWxx00	Outputs
	OUT01	OBxx008	Output 1
	⋮	⋮	⋮
	OUT08	OBxx00F	Output 8

■ 100-VAC 8-point Input Module

IN		IWxx00	Inputs
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN08	IBxx007	Input 8

■ 24-VDC 16-point Input Module

IN		IWxx00	Inputs
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN16	IBxx00F	Input 16

■ 24-VDC 16-point Output Module

OUT		OWxx00	Outputs
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT16	OBxx00F	Output 16

A.4 System Structures

The following table lists the variables included in each system structure.

- "∗" corresponds to M, D, or A registers.
- Register address xW (xB/xL/xF/xA indicates the leading register address +00.

System Structure Name	Variable Name	Resister	Comments
PI_W:PI Control (integer type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	Integration reset
	Kp	xWxxx01	P gain
	Ki	xWxxx02	Integration adjustment gain
	Ti	xWxxx03	Integration time
	IUL	xWxxx04	Upper integration limit
	ILL	xWxxx05	Lower integration limit
	UL	xWxxx06	Upper PI limit
	LL	xWxxx07	Lower PI limit
	DB	xWxxx08	PI output dead band
	Y	xWxxx09	PI output
	Yi	xWxxx10	I offset
	IREM	xWxxx11	I remainder
PI_F:PI Control (real number type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	Integration reset
	RESERVE	xWxxx01	Reserve
	Kp	xFxxx02	P gain
	Ki	xFxxx04	Integration adjustment gain
	Ti	xFxxx06	Integration time
	IUL	xFxxx08	Upper integration limit
	ILL	xFxxx10	Lower integration limit
	UL	xFxxx12	Upper PI limit
	LL	xFxxx14	Lower PI limit
	DB	xFxxx16	PI output dead band
	Y	xFxxx18	PI output
	Yi	xFxxx20	I offset
PD_W:PD Control (integer type)	RLY	xWxxx00	Relay I/O
	Kp	xWxxx01	P gain
	Kd	xWxxx02	D gain
	Td1	xWxxx03	Divergence differential time
	Td2	xWxxx04	Convergence differential time
	UL	xWxxx05	Upper PD limit
	LL	xWxxx06	Lower PD limit
	DB	xWxxx07	PD output dead band
	Y	xWxxx08	PD output
	X	xWxxx09	Input value storage

(cont'd)

System Structure Name	Variable Name	Resister	Comments
PD_F:PD Control (real number type)	RLY	xWxxx00	Relay I/O
	RESERVE	xWxxx01	Reserve
	Kp	xFxxx02	P gain
	Kd	xFxxx04	D gain
	Td1	xFxxx06	Divergence differential time
	Td2	xFxxx08	Convergence differential time
	UL	xFxxx10	Upper PD limit
	LL	xFxxx12	Lower PD limit
	DB	xFxxx14	PD output dead band
	Y	xFxxx16	PD output
	X	xFxxx18	Input value storage
PID_W:PID Control (integer type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	Integration reset
	Kp	xWxxx01	P gain
	Ki	xWxxx02	I gain
	Kd	xWxxx03	D gain
	Ti	xWxxx04	Integration time
	Td1	xWxxx05	Divergence differential time
	Td2	xWxxx06	Convergence differential time
	IUL	xWxxx07	Upper integration limit
	ILL	xWxxx08	Lower integration limit
	UL	xWxxx09	Upper PID limit
	LL	xWxxx10	Lower PID limit
	DB	xWxxx11	PID output dead band
	Y	xWxxx12	PID output
	Yi	xWxxx13	I offset
	IREM	xWxxx14	I remainder
	X	xWxxx15	Input value storage
PID_F:PID Control (real number type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	Integration reset
	RESERVE	xWxxx01	Reserve
	Kp	xFxxx02	P gain
	Ki	xFxxx04	I gain
	Kd	xFxxx06	D gain
	Ti	xFxxx08	Integration time
	Td1	xFxxx10	Divergence differential time
	Td2	xFxxx12	Convergence differential time
	IUL	xFxxx14	Upper integration limit
	ILL	xFxxx16	Lower integration limit
	UL	xFxxx18	Upper PID limit
	LL	xFxxx20	Lower PID limit
	DB	xFxxx22	PID output dead band
	Y	xFxxx24	PID output
	Yi	xFxxx26	I offset
	X	xFxxx28	Input value storage

(cont'd)

System Structure Name	Variable Name	Resister	Comments
LAG_W: First-Order LAG (integer type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	LAG reset
	T	xWxxx01	First-order lag time constant
	Y	xWxxx02	LAG output
	REM	xWxxx03	Remainder
LAG_F:First-Order LAG (real number type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	LAG reset
	RESERVE	xWxxx01	Reserve
	T	xFxxx02	First-order lag time constant
	Y	xFxxx04	LAG output
LLAG_W: Phase LEAD/LAG (integer type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	LLAG reset
	T2	xWxxx01	Phase lead time constant
	T1	xWxxx02	Phase lag time constant
	Y	xWxxx03	LLAG output
	REM	xWxxx04	Remainder
	X	xWxxx05	Input value storage
LLAG_F: Phase LEAD/LAG (real number type)	RLY	xWxxx00	Relay I/O
	RLY.IRST	xBxxx000	LLAG reset
	RESERVE	xWxxx01	Reserve
	T2	xFxxx02	Phase lead time constant
	T1	xFxxx04	Phase lag time constant
	Y	xFxxx06	LLAG output
	X	xFxxx08	Input value storage
LAU_W: Linear Accelerator 1 (integer type)	RLY	xWxxx00	Relay I/O
	RLY.RN	xBxxx000	Line is running.
	RLY.QS	xBxxx001	Quick stop
	RLY.DVDTF	xBxxx002	DVDT operation non-execution
	RLY.DVDTS	xBxxx003	DVDT operation selection
	RLY.ARY	xBxxx008	In acceleration
	RLY.BRY	xBxxx009	In deceleration
	RLY.LSP	xBxxx00A	Zero speed
	RLY.EQU	xBxxx00B	Coincidence
	LV	xWxxx01	100% input level
	AT	xWxxx02	Acceleration time
	BT	xWxxx03	Deceleration time
	QT	xWxxx04	Quick stop time
	V	xWxxx05	Current speed
	DVDT	xWxxx06	Current acceleration / deceleration
	RESERVE	xWxxx07	Reserve
	VIM	xWxxx08	Previous speed instruction
	DVDTK	xWxxx09	DVDT coefficient
	REM	xLxxx10	Remainder

(cont'd)

System Structure Name	Variable Name	Resister	Comments
LAU_F: Linear Accelerator 1 (real number type)	RLY	xWxxx00	Relay I/O
	RLY.RN	xBxxx000	Line is running.
	RLY.QS	xBxxx001	Quick stop
	RLY.ARY	xBxxx008	In acceleration
	RLY.BRY	xBxxx009	In deceleration
	RLY.LSP	xBxxx00A	Zero speed
	RLY.EQU	xBxxx00B	Coincidence
	RESERVE	xWxxx01	Reserve
	LV	xFxxx02	100% input level
	AT	xFxxx04	Acceleration time
	BT	xFxxx06	Deceleration time
	QT	xFxxx08	Quick stop time
	V	xFxxx10	Current speed
	DVDT	xFxxx12	Current acceleration/deceleration
SLAU_W: Linear Accelerator 2 (integer type)	RLY	xWxxx00	Relay I/O
	RLY.RN	xBxxx000	Line is running.
	RLY.QS	xBxxx001	Quick stop
	RLY.DVDTF	xBxxx002	DVDT operation non-execution
	RLY.DVDTS	xBxxx003	DVDT operation selection
	RLY.ARY	xBxxx008	In acceleration
	RLY.BRY	xBxxx009	In deceleration
	RLY.LSP	xBxxx00A	Zero speed
	RLY.EQU	xBxxx00B	Coincidence
	RLY.CCF	xBxxx00D	Work relay
	RLY.BBF	xBxxx00E	Work relay
	RLY.AAF	xBxxx00F	Work relay
	LV	xWxxx01	100% input level
	AT	xWxxx02	Acceleration time
	BT	xWxxx03	Deceleration time
	QT	xWxxx04	Quick stop time
	AAT	xWxxx05	S-curve acceleration time
	BBT	xWxxx06	S-curve deceleration time
	V	xWxxx07	Current speed
	DVDT1	xWxxx08	Current acceleration/deceleration 1
	RESERVE1	xWxxx09	Reserve
	ABMD	xWxxx10	Speed increase upon holding
	REM1	xWxxx11	Remainder
	RESERVE2	xWxxx12	Reserve
	VIM	xWxxx13	Previous speed instruction
	DVDT2	xLxxx14	Current acceleration/deceleration 2
	DVDT3	xLxxx16	Current acceleration/deceleration 3
	REM2	xLxxx18	Remainder
	REM3	xWxxx20	Remainder
	DVDTK	xWxxx21	DVDT1 coefficient

(cont'd)

System Structure Name	Variable Name	Resister	Comments
SLAU_F: Linear Accelerator 2 (real number type)	RLY	xWxxx00	Relay I/O
	RLY.RN	xBxxx000	Line is running.
	RLY.QS	xBxxx001	Quick stop
	RLY.ARY	xBxxx008	In acceleration
	RLY.BRY	xBxxx009	In deceleration
	RLY.LSP	xBxxx00A	Zero speed
	RLY.EQU	xBxxx00B	Coincidence
	RESERVE	xWxxx01	Reserve
	LV	xFxxx02	100% input level
	AT	xFxxx04	Acceleration time
	BT	xFxxx06	Deceleration time
	QT	xFxxx08	Quick stop time
	AAT	xFxxx10	S-curve acceleration time
	BBT	xF0xxx12	S-curve deceleration time
	V	xFxxx14	Current speed
	DVDT	xFxxx16	Current acceleration/deceleration
	ABMD	xFxxx18	Speed increase upon holding
PWM:Pulse Width Modulation	RLY	xWxxx00	Relay I/O
	RLY.PWMRST	xBxxx000	PWM reset
	RLY.PWMOUT	xBxxx008	PWM output
	PWMT	xWxxx01	PWM cycle
	ONCNT	xWxxx02	ON output setting timer
	CVON	xWxxx03	ON output counting timer
	CVONREM	xWxxx04	ON output counting timer remainder
	OFFCNT	xWxxx05	OFF output setting timer
	CVOFF	xWxxx06	OFF output counting timer
	CVOFFREM	xWxxx07	OFF output counting timer remainder
MSG_SND_IN: Send Message Input	EXECUTE	xBxxx000	Instruction
	ABORT	xBxxx001	Forced interruption instruction
	DEV_TYP	xWxxx01	Type of transmission device
	PRO_TYP	xWxxx02	Transmission protocol
	CIR_NO	xWxxx03	Circuit Number
	CH_NO	xWxxx04	Transmission buffer channel Number

(cont'd)

System Structure Name	Variable Name	Resister	Comments
MSG_SND_PARAM: Send Message Parameter	RESULT	xWxxx00	Process result
	STS	xWxxx01	Status
	ST_NO	xWxxx02	Called station #
	OPTION	xWxxx03	Option
	F_CODE	xWxxx04	Function code
	DATA_ADR	xWxxx05	Data address
	DATA_SIZE	xWxxx06	Data size
	CPU_NO	xWxxx07	Called CPU#
	COIL_OFFSET	xWxxx08	Coil offset
	INRLY_OFFSET	xWxxx09	Input relay offset
	INREG_OFFSET	xWxxx10	Input register offset
	HOLDREG_OFFSET	xWxxx11	Holding register offset
	RESERVE1	xWxxx12	System reserve
	RESERVE2	xWxxx13	System reserve
	RESERVE3	xWxxx14	System reserve
	RESERVE4	xWxxx15	System reserve
	RESERVE5	xWxxx16	System reserve
MSG_SND_OUT: Send Message Output	BUSY	xBxxx000	Message is being sent.
	COMPLETE	xBxxx001	The sending of the message has been completed.
	ERROR	xBxxx002	Occurrence of error
MSG_RCV_IN: Receive Message Input	EXECUTE	xBxxx000	Instruction
	ABORT	xBxxx001	Forced interruption instruction
	DEV_TYP	xWxxx01	Type of transmission device
	PRO_TYP	xWxxx02	Transmission protocol
	CIR_NO	xWxxx03	Circuit Number
	CH_NO	xWxxx04	Transmission buffer channel Number
MSG_RCV_PARAM: Receive Message Parameter	RESULT	xWxxx00	Process result
	STS	xWxxx01	Status
	ST_NO	xWxxx02	Called station #
	OPTION	xWxxx03	Option
	F_CODE	xWxxx04	Function code
	DATA_ADR	xWxxx05	Data address
	DATA_SIZE	xWxxx06	Data size
	CPU_NO	xWxxx07	Called CPU#
	COIL_OFFSET	xWxxx08	Coil offset
	INRLY_OFFSET	xWxxx09	Input relay offset
	INREG_OFFSET	xWxxx10	Input register offset
	HOLDREG_OFFSET	xWxxx11	Holding register offset
	W_LO	xWxxx12	Write-in range LO
	W_HI	xWxxx13	Write-in range HI
	RESERVE1	xWxxx14	System reserve
	RESERVE2	xWxxx15	System reserve
	RESERVE3	xWxxx16	System reserve
MSG_RCV_OUT: Receive Message Output	BUSY	xBxxx000	Message is being sent.
	COMPLETE	xBxxx001	Message is being received.
	ERROR	xBxxx002	Occurrence of error

(cont'd)

System Structure Name	Variable Name	Resister	Comments
TBLBR:Block Read	ROW1	xLxxx00	Beginning row number
	COL1	xLxxx02	Beginning column number
	RLEN	xWxxx04	Number of row elements
	CLEN	xWxxx05	Number of column elements
TBLBW:Block Write	ROW1	xLxxx00	Beginning row number
	COL1	xLxxx02	Beginning column number
	RLEN	xWxxx04	Number of row elements
	CLEN	xWxxx05	Number of column elements
TBLSRL:Row Search	ROW1	xLxxx00	Head row number
	ROW2	xLxxx02	Last row number
	COLUMN	xLxxx04	Table element column number
	FIND	xWxxx06	Search result
TBLSRC:Column Search	ROW	xLxxx00	Row number
	COLUMN1	xLxxx02	Head column number
	COLUMN2	xLxxx04	Last column number
	FIND	xWxxx06	Search result
TBLCL:Block Clear	ROW	xLxxx00	Head row number
	COLUMN	xLxxx02	Head column number
	RLEN	xWxxx04	Number of row elements
	CLEN	xWxxx05	Number of column elements
TBLMV:Block Move	ROW1	xLxxx00	Head row number
	COLUMN1	xLxxx02	Head column number
	RLEN	xWxxx04	Number of row elements
	CLEN	xWxxx05	Number of column elements
	ROW2	xLxxx06	Head row number
	COLUMN2	xLxxx08	Head column number
QTBLR:Queue Table Read	ROW	xLxxx00	Corresponding row
	COLUMN	xLxxx02	Head column number
	CLEN	xWxxx04	Number of column elements
	RESERVE	xWxxx05	System reserve
	RPTR	xLxxx06	Read pointer
	WPTR	xLxxx08	Write pointer
QTBLRI: Queue Table Read (pointer move)	ROW	xLxxx00	Corresponding row
	COLUMN	xLxxx02	Head column number
	CLEN	xWxxx04	Number of column elements
	RESERVE	xWxxx05	System reserve
	RPTR	xLxxx06	Read pointer
	WPTR	xLxxx08	Write pointer
QTBLW:Queue Table Write	ROW	xLxxx00	Corresponding row
	COLUMN	xLxxx02	Head column number
	CLEN	xWxxx04	Number of column elements
	RESERVE	xWxxx05	System reserve
	RPTR	xLxxx06	Read pointer
	WPTR	xLxxx08	Write pointer

(cont'd)

System Structure Name	Variable Name	Resister	Comments
QTBLWI: Queue Table Write (pointer move)	ROW	xLxxx00	Corresponding row
	COLUMN	xLxxx02	Head column number
	CLEN	xWxxx04	Number of column elements
	RESERVE	xWxxx05	System reserve
	RPTR	xLxxx06	Read pointer
	WPTR	xLxxx08	Write pointer
MSEE:Call Motion Program	Status	xWxxx00	Status
	Status.Run	xBxxx000	Running
	Status.Pause	xBxxx001	Pausing
	Status.SystemPause	xBxxx002	Stopped
	Status.SingleBlockPause	xBxxx004	Stopped under single block mode
	Status.Alarm	xBxxx008	Alarm
	Status.Break	xBxxx009	Stopped at break point
	Status.Debug	xBxxx00B	Debugging mode
	Status.History	xBxxx00D	Start request signal history
	Status.SystemWorkError	xBxxx00E	No system work error
	Status.ProgramNoError	xBxxx00F	Main program number limit error
	Control	xWxxx01	Motion program control signals
	Control.Run	xBxxx010	Start request
	Control.Pause	xBxxx011	Pause request
	Control.Stop	xBxxx012	Stop request
	Control.SingleBlockMode	xBxxx013	Single block modee selection
	Control.SingleBlockRun	xBxxx014	Single block start request
	Control.AlarmReset	xBxxx015	Alarm reset request
	Control.Continue	xBxxx016	Program continuous operation start request
	Control.Skip1	xBxxx018	Skip1 information
	Control.Skip2	xBxxx019	Skip2 information
	Control.SetSystemWork	xBxxx01D	System work number setting
	Control.SetInterpolate	xBxxx01E	Interpolation override setting
	InterpolateOverride	xWxxx02	Interpolation override
	SystemWorkNumber	xWxxx03	System work numbers
MLINK_SVW: Write SERVOPACK Parameter	STS	xWxxx00	Status
	ERR_CODE	xWxxx01	Error code
	CIR_NO	xWxxx02	Circuit Number
	AXIS_NO	xWxxx03	Axis Number
	SYSTEM1	xWxxx04	System 1
	SYSTEM2	xWxxx05	System 2

B Reserved Words

The following words cannot be used for variable names regardless of case.

ABS
ACC
ACCMODE
ACOS
ACS
ARCTAN
ASIN
ASN
ATAN
ATN
AUTO
BCD
BIN
BLK
BREAK
CASE
CHAR
CLR
CONST
CONTINUE
COS
DCC
DEFAULT
DO
DOUBLE
ELSE
END
ENUM
EOX
EXM
EXP
EXTERN
FALSE
FEND
FLOAT
FMX
FOR
GOTO
IAC
IDC
IEND
IF
IFP
INC
INP
INT
IOW
JOINTO
KCC
KCW
LCC
LCW
LOG
LOG10
LONG
MCC
MCW
MOD
MOV
MSEE
MUFC
MVM
MVS
MVT
NON
OFF
ON
PFN
PFORK
PJOINT
PLD
PLN
PON
POS
REGISTER
RET
RETURN
R{
SCC
SFL
SFORK
SFR
SHORT
SIGNED
SIN
SIZEOF
SJOINT
SKP
SNGD
SNGE
SPH
SPL
SQRT
SQT
STATIC
STRUCT
SWITCH
S{
TAN
TCN
TCR
TCS
TIM
TOF
TON
TPS
TRUE
TYPEDEF
UFC
UNION
UNSIGNED
VCR
VCS
VEL
VOID
VOLATILE
WAX
WCD
WCE
WCT
WDA
WDB
WDC
WDD
WEND
WHILE
WPM
WSA
ZRN

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			1.12.4	Addition: Online Security
			Chapter 2	Addition: Configuration (Module Configuration Definition, Export/Import of Motion Parameters
			3.2.5	Addition: Displaying and Editing Ladder Programs Created by MPE720 version 5 on MPE720 version 6
			3.5.6	Addition: Forcing Coils ON/OFF
			3.6	Addition: Converting CP Ladder Programs
			5.6	Addition: User Structures
			5.8	Addition: Export/Import of Variables
			10.1.3	Addition: Individual/Batch Printing of Ladder Programs
			10.1.4	Addition: Prinding Cross Reference Information
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			A.2	Modification: Axis Variable Set Details
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Engineering Tool for MP2000 Series Machine Controller

MPE720 Version 6

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